

*City of Portland Bureau of Transportation*  
**Asset Status and Condition Report 2013**



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**CITY OF PORTLAND  
BUREAU OF TRANSPORTATION**

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# Introduction

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*The Status and Condition report is an asset management tool for tracking the physical assets owned by the Portland Bureau of Transportation – specifically, their condition, any unmet funding needs for proper maintenance, and what the major accomplishments were in each asset category in the previous fiscal year.*

The Portland Bureau of Transportation (PBOT) manages transportation assets worth \$8 billion. Portland's transportation system helps move people, goods, freight and emergency response vehicles through the City. Motor vehicles, mass transit, bicyclists and pedestrians all benefit from the development, operations and maintenance of Portland's infrastructure. Portland's transportation system is a network of streets, sidewalks, bike lanes, bridges, traffic control devices, parking facilities, streetcars and an aerial tram. These combined assets make Portland one of the most livable cities in the country.

The Asset Status and Condition report is a tool for tracking the physical assets owned by the Portland Bureau of Transportation – specifically, their condition, any unmet funding needs for proper maintenance, and what the major accomplishments were in each asset category in the previous fiscal year. The report also highlights how we prioritize the maintenance and operations of the infrastructure out in the field. With insufficient resources to meet all the maintenance needs of the infrastructure, prioritizing maintenance needs ensures that we address the highest-risk assets first. This report contains data from July 2012 - June 30, 2013.

The goal of asset management is to provide a targeted level of service and performance for various assets within the transportation network, in a cost-effective manner, by making the right amount of investment for the right asset in the right location at the right time.

PBOT's approach to asset management allows us to monitor asset status and condition, determine level of service, measure performance, and determine unmet need. Using good data and information, we can better plan how to maintain, rehabilitate and replace assets through timely, cost-effective management, program development and resource allocation.

PBOT's Asset Management Advisory Committee (which includes engineers and operations staff as well as maintenance, finance, and information technology managers) sets the priorities for asset management within the Bureau and helps implement those priorities into appropriate business practices.

*"The Tram eliminates the need for an estimated 2 million vehicle miles annually, thereby saving 93,000 gallons of gas and reducing greenhouse emissions by more than 1,000 tons."*



# Portland Aerial Tram

*The Aerial Tram is Portland's public transportation link connecting the South Waterfront with Marquam Hill and OHSU's campus. It opened to the public in January 2007, it's owned by the City of Portland and operated by OHSU. The tram plays a vital role in the development and growth of the South Waterfront.*

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The Portland Aerial Tram opened to the public in January 2007, it is owned by the City of Portland and operated by OHSU. The tram plays a vital role in the development and growth of the South Waterfront.

The University's decision to expand to the riverfront, which hinged on construction of the Tram, provided the catalyst for some \$2 billion in investments in the South Waterfront after years of failed efforts by private developers. The district is rapidly taking shape as a dynamic new neighborhood of high-rise condominiums with a greenway along the river and access to the Portland Streetcar.

The Tram also represents another pioneering step in Portland's march toward a sustainable future. The Tram links seamlessly to the energy-efficient Streetcar which, in turn, provides a connection to the rest of the city and other public transit options.

## Condition

Three types of inspections are conducted on the Tram and its components. Every two years the lower and upper stations and tower are inspected for structural integrity. Every year the control systems and ropes are inspected to assess their current condition. Based on the inspection results, any necessary maintenance is prioritized and addressed.

Currently, all the tram components are in good condition, as the tram is relatively new. Over time, the condition of some of the "non-essential" components of the structures (e.g. paint) may deteriorate below fair; however, major maintenance will always be prioritized to ensure that the system is safe for all users.

***"The goal for managing the Tram structure is that 95% of the tram system will be in fair or better condition. Currently, PBOT is exceeding that goal, as 100% of the tramway and related structures are in fair or better condition."***





## Goal

An established goal is to minimize the time during which the tram is not operable. There are instances when the tram must be shut down to maintain the safety of the passengers, generally due to weather or other unforeseen events. Maintenance to the tram is usually conducted during the hours it is closed for business. PBOT exceeded its service target in the past year; the tram was inoperable less than 1% of the time during operating hours.

## Unmet Need

There is no unmet need for the Aerial Tram. Maintenance costs are covered by the revenues generated by tram fares. Approximately \$150,000 each year is set aside for addressing maintenance needs identified in the routine inspections.

## Accomplishments

✓ Tram ridership surpassed 9.5 million riders since the tram opened. The tram has covered over 234,000 miles to date – equivalent to 98% of the distance between Earth and the moon! ■

## ► STATUS

	2012	2013
Tramway	1	1
Haul Rope (Linear Feet)	7,150	7,150
Tramcars	2	2
Average Annual Ridership	1.5 M	1.6 M
Replacement Value*	\$52.8 M	\$54.3 M

\*Confidence level of replacement value: High

## ► LEVELS OF SERVICE

	TARGET	FY 12-13
% of time Tram is inoperable due to maintenance issues/needs	1%	0.03%
% of Tram system in fair or better condition (tramway and related structures only)	95%	100%

## ► TRANSPORTATION SYSTEM STATUS, CONDITION + VALUE

FACILITY	STATUS	REPLACEMENT VALUE	CONDITION					TOTAL UNMET NEED
			VG	G	F	P	VP	
Aerial Tram*	1	\$54,292,721		100%				\$0

\*Tramway and related structures, equipment, upper station, tower, lower station, and rolling stock (including cables)



*“How old are our City Bridges? Six of PBOT’s bridges exceed 100 years and 29 bridges are over 75 years old. Six bridges are less than five years old.”*



# Bridges & Structures

*157 bridges that the City of Portland owns and maintains are located throughout Portland's neighborhoods and industrial districts. All of the bridges are a vital part of the City's infrastructure, providing passage for travelers and freight over highways, bodies of water, and other obstacles.*

"Bridge City" is famous for the many recognizable spans that cross the Willamette River. However, these bridges are not owned or maintained by the City of Portland's Bureau of Transportation. They are owned by Multnomah County, the State of Oregon, or Union Pacific Railroad.

157 bridges that the City of Portland owns and maintains are located throughout Portland's neighborhoods and industrial districts. All of the bridges are a vital part of the City's infrastructure, providing passage for travelers and freight over highways, bodies of water, and other obstacles.

## Condition

*How old are our bridges?* The design life of a bridge is recognized as 75 years. Many of PBOT's bridges exceed this age, but are still in use. Six of PBOT's bridges exceed 100 years and 29 bridges are over 75 years old. Six bridges are less than five years old.

*Are our bridges in good shape?* PBOT's bridges are continually exposed to harsh weather as well as pounding traffic from trucks and buses. This continual wear and tear causes the bridges to deteriorate over time, necessitating routine and preventive maintenance. 83% of PBOT's bridges are in fair or better condition while 17% are considered to be in poor

or very poor condition. The overall bridge condition improved as a result of making improvements to the NE 21st Ave. Bridge over the Columbia Slough, and reducing the inventory of bridges, some of which were not in good condition. *(For condition definitions, see Appendix A.)*

### *How many bridges are weight-restricted?*

Many of PBOT's older bridges were designed for traffic loads that no longer meet modern freight demands. Consequently, PBOT has weight restricted the use of these bridges to prevent premature structure failure or excessive damage, which would require costly rehabilitation. Currently, 22 of PBOT's bridges are weight restricted, which represents 14% of the inventory.

Weight restrictions on bridges negatively affect the movement of freight and goods throughout the City. Beyond the economic impacts, freight drivers must find alternate routes, which extends travel time, uses more fuel and harms our environment.

### *How often are the Bridges inspected?*

PBOT's bridges are inspected every two years by certified bridge inspectors. PBOT engineers utilize the inspection reports to prioritize maintenance work, and Maintenance Operations crews conduct superstructure and deck repairs.

*The Gibbs St. Pedestrian Bridge shown below opened on July 14, 2012. The eastern end is accessed by an elevator tower.*



*How would an earthquake affect City bridges?*

Recent earthquakes that Portland has experienced have been relatively minor in magnitude. Most of PBOT's older bridges were not designed to resist earthquakes and could collapse in a moderate quake event, even if they are structurally in good condition. Fifty-one percent of the City's bridge inventory, or 81 bridges, require seismic upgrades of some kind. Full replacement rather than rehabilitation is recommended for 17 of the 81 bridges.

PBOT has made recent progress on strengthening and upgrading some of its bridges to resist earthquakes. In 2012-2013 that included the bridge at NE 21st Ave Columbia Slough. PBOT has also written a Post-Earthquake Bridge Inspection Response Plan which outlines a systematic, efficient, and prioritized inspection of all bridges after an earthquake.

Goal

PBOT's goal for no more than 5% of bridges to require critical maintenance represents bridges that need immediate maintenance to ensure that they do not fall into worse condition or become weight restricted. This subset does not represent all the bridges in poor condition. The target of 5% was set because both PBOT and the public expect bridges to be safe and in fair or better condition.

PBOT also aims to reduce the percentage of weight restricted bridges below 5%. Bridges serve an important function in Portland's economy. Timely maintenance and replacement of bridges reduces long-term costs and ensures safety. Preserving the structural integrity of the bridges is important for PBOT as well as the freight, transit and emergency response providers.

Unmet Need

*What would it cost to fix the major problems for all of PBOT's bridges?*

The unmet need for deficient bridges is estimated at \$128.6 million spread over ten years. This includes capital (non-maintenance) needs to address weight restrictions, rehabilitations, or seismic upgrades for 88 bridges, 21 of which require full replacement. This figure does not include recurring costs required to perform routine and preventive maintenance.

Unmet need is defined as the amount of additional funding and resources needed to bring a given asset class to a fair or better condition and to maintain it at that condition. For bridges, seismic upgrades, rehabilitation, and replacement needs factor into the unmet need.

PBOT has created a Risk Assessment Deficiency Ranking system to identify which bridges are in greatest need of

repairs, rehabilitation, or replacement. This allows PBOT to prioritize funding requests and existing resources while managing the condition of its entire bridge inventory.

Prioritization

Bridges are the priority for Maintenance and Operations work. Bridges are assigned to a category using the scoring tool from the National Bridge Health Index. The State of Oregon inspects all City-owned bridges every two years. The prioritization list reflects maintenance needs rather than capital replacement needs, seismic upgrades, or functional deficiencies (weight restrictions, bicycle/pedestrian access).

1	Critical	Safety issue, structural capacity or prioritized programming
2	Urgent	Structural capacity, deterioration or serviceability issues
3	Routine	Serviceability issues or asset preservation
4	Monitor	Monitor for changing conditions
5	No Action	No current PBOT maintenance



## Accomplishments

PBOT's bridge maintenance crews work year round to improve the condition of the bridges through routine and preventive maintenance in addition to minor and major structural repairs. This work can prolong the service life of the bridges.

The following is a list of some of the major maintenance projects PBOT's maintenance crews have undertaken during fiscal year 2012-2013.

*What are some of PBOT's bridges that need major rehabilitation in lieu of replacement? Replacing deficient bridge components can be a more*

*sustainable approach than replacing an entire bridge. In 2014, PBOT will use City and federal grant funding to carry out substantial rehabilitation to the NW Thurman Ave Bridge over Balch Creek. This project will preserve an historic 108-year-old bridge, and renew it for decades of future service. ■*



*NW Thurman Bridge over Balch Creek will receive modernization upgrades in 2014, eliminating the current weight restriction and replacing the plank walkway for pedestrians with skid-resistant aluminum.*

## ► MAJOR MAINTENANCE PROJECTS DURING FY 12-13

STRUCTURE	PROJECT DESCRIPTION
NE 42nd bridge over Lombard	Patched cracks in sidewalk and bridge deck and added a layer of epoxy to prevent water intrusion
N Willamette Blvd Semi-Viaduct	Patched cracks and spalling over exposed re-bar in the superstructure.
SE Harney bridge over Johnson Creek	Rebuilt wing wall of east abutment
Lombard bridge over Columbia Slough	New concrete deck and cantilever sidewalk
SE Johnson Creek Blvd bridge over Johnson Creek	Rebuilt abutment on west side of pedestrian structure
SW Montgomery Drive bridge at SW Carter Lane	Repaired pilaster
Stairs at SW Mill St.	Stair repair

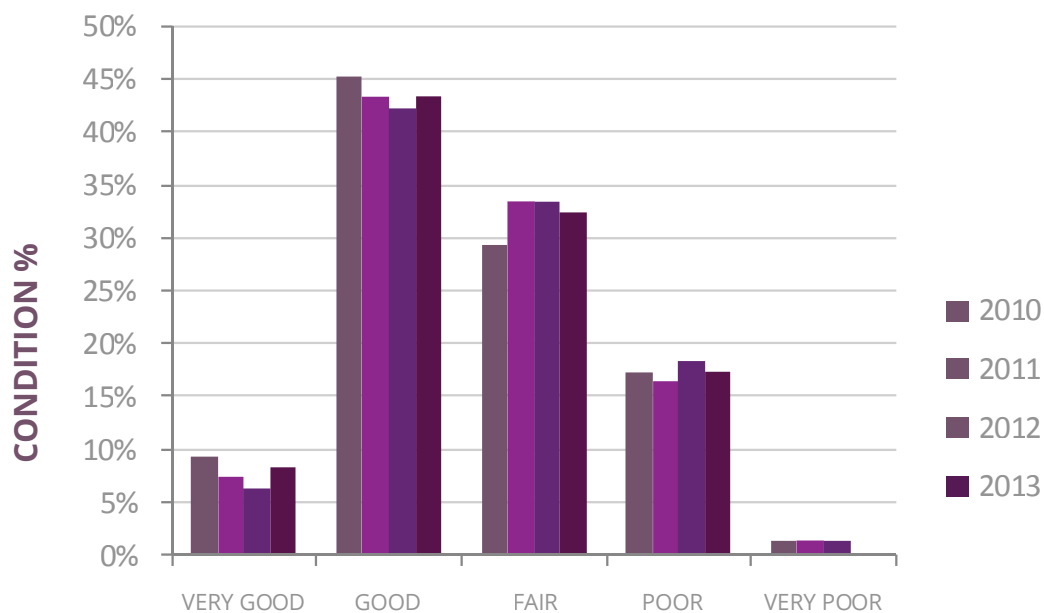


A bridge on N. Vancouver Ave. over the Columbia Slough opened to the public in 2010



PBOT is responsible for maintaining stairways, retaining walls, the harbor wall, the floating dock, the China Gate and culverts.

### ► BRIDGE CONDITION





## ► STATUS

	2012	2013
Bridges	160	157
Retaining Walls	555	557
Stairways	188	188
Harbor Wall	5,134 ft	5,134 ft
Elevators	0	1
Replacement Value*	\$698 M	\$699.6 M

\* Confidence level of replacement value: high

## ► LEVELS OF SERVICE

	TARGET	FY 12-13
% of bridges requiring critical maintenance	5%	5%
% of bridges that are weight restricted	5%	14%

## ► TRANSPORTATION SYSTEM STATUS, CONDITION + VALUE

STRUCTURES	STATUS	REPLACEMENT VALUE	CONDITION					TOTAL UNMET NEED
			VG	G	F	P	VP	
Bridges	157	\$382,166,069	8%	43%	32%	17%	0%	\$128,623,998
Retaining Walls	557	\$109,350,019	68%	22%	8%	2%	0%	\$5,039,347
Stairways	188	\$6,353,816	19%	58%	21%	2%	0%	\$923,180
Harbor Wall	5,134 ft	\$192,836,717		100%				\$0
Elevator	1	\$500,000	100%					TBD
		\$697,206,621						\$134,586,525

*“Garages support the economic vitality of the Central City by providing an affordable system of parking garages which primarily meets the short-term needs of shoppers, visitors and business clients.”*



# Parking Garages

*Our mission is to support the economic viability of the Central City by providing an affordable system of parking garages which primarily meets the short-term needs of shoppers, visitors and business clients.*

The City owns and operates six SmartPark Garages, with a mission to support the economic viability of the Central City by providing an affordable system of parking garages which primarily meets the short-term needs of shoppers, visitors and business clients. The SmartPark rate structure is set up to encourage short-term turnover, however several garages do allow monthly parking permits in an effort to maximize revenue potential. While the hourly rates are below market, the monthly parking rates are at market rate except in the retail core garages where the monthly rates are set above market rate as an incentive to encourage short-term use. Revenues from the garages support maintenance and operations of those facilities, and any additional revenue is used to support PBOT's operations and maintenance programs.

## Condition

Four out of six garages are in good condition. Two of the garages are in fair condition, including one that was downgraded from good condition this year. The City's Facilities Services staff

conducts yearly inspections of the garages to identify maintenance needs. Facilities Services performs all the major maintenance on the garages as well as preventive maintenance to ensure that they are in good working order. Keeping with its goal of maintaining garages in good or very good condition, PBOT will continue conducting preventive maintenance in the next year and explore the reasons behind the downgrade of one of its garages. Facilities Services is working to provide a 3rd party assessment of the garages.

It is realistic to expect that all six parking garages stay in good or better condition. The customers who park in the garages expect to find them safe, clean and maintained.

## Goal

It is realistic to expect that all six parking garages stay in good or better condition. The customers who park in the garages expect to find them safe, clean, and maintained.

*“Maintenance costs are covered by the revenues generated by the garages. Approximately \$5 million is transferred annually from the Parking Facilities Fund to the Transportation Operating Fund to support operational activities.”*



## Unmet Need

There is no unmet need for the parking garages. Costs for maintenance and repairs are covered by the parking revenues. Approximately \$5 million is transferred annually from the Parking Facilities Fund to the Transportation Operating Fund to support PBOT's operational activities.

Naito & Davis Garage to relieve high occupancy rates and ensure sufficient short term parking availability.

- ✓ Approved two new restaurant leases as part of a plan to activate the 4th and Alder corner commercial space, which also will result in increased revenues. ■

## Accomplishments

- ✓ Completed the transition to a new automated payment system in five of the City's six garages in an effort to reduce peak time congestion, provide more payment options for customers, and improve overall financial performance.
- ✓ Restructured the City's Garage Equipment Maintenance Contract in order to improve accountability, ensure budget predictability, and clarify Payment Card Industry (PCI) Compliance responsibilities.
- ✓ Successfully completed the annual PCI Compliance Audit, ensuring that the new automated payment system in the SmartPark Garages is PCI compliant.
- ✓ Monitored the new rates and new rate structure implemented in the previous year to determine impact on each SmartPark Garage operational and financial performance. Increased the all-day rate at the

*Downtown Portland  
SmartPark Garage*



## ► STATUS

	2012	2013
Garages	6	6
# of parking spaces	3,784	3,765
Heliport	1	1
Square feet of retail space	71,8000	71,8000
Replacement Value*	\$121.4 M	\$108.6 M

\* Confidence level of replacement value: optimal

## ► LEVEL OF SERVICE

	TARGET	FY 12-13
% of garages in good or better condition. Includes inspections of the structure and the surface coating.	100%	67%

## ► TRANSPORTATION SYSTEM STATUS, CONDITION + VALUE

FACILITY	STATUS	REPLACEMENT VALUE	CONDITION					TOTAL UNMET NEED
			VG	G	F	P	VP	
Parking Garages	6	\$108,600,000		67%	33%			\$0



*“City Council approved creation of the Central Eastside Meter District. Crews installed 24 pay stations within the district as part of a phased implementation.”*



# Parking Meter System

*By metering parking spaces or requiring permits, more people can access the parking spaces throughout the day. Revenues collected through the parking system are used to fund the City's transportation system.*

The purpose of the on-street parking meter system is to encourage turnover, reduce traffic congestion and provide convenient access to adjacent businesses and facilities in the Central Business District (CBD) and in Portland's vibrant neighborhoods. By metering parking spaces or requiring permits, more people can access the parking spaces throughout the day. Revenues collected through the parking system are used to fund the City's transportation system.

Enforcement of the parking system supports retail and commercial businesses and enhances neighborhood livability. Parking enforcement officers refer to parking control signs and pavement markings to monitor turnover and access and ensure that parking regulations are observed.

The parking meter system has three aspects:

- ▶ The physical equipment – meters, parking control signs and pavement markings.

- ▶ The “back office” software system which supports, tracks and reports on individual pay station performance and pay station status and activity.

- ▶ A business process for maintaining and operating the equipment, interfacing with customers for enforcement, maintaining the assets, coordinating with adjacent land users and providing customer service.

PBOT currently uses two types of meters: single meters and multi-space pay stations. The single meters are coin-operated. The multi-space pay stations accept credit or debit cards, coins, and the City's SmartCard. Pay stations issue time-stamped receipts which must be displayed in the vehicle's curbside window. Pay stations control about 95% of the paid parking spaces in the Central Business District (CBD), which includes the Pearl and South Waterfront Districts.

*“Each pay station incorporates a 10 watt solar panel that recharges the batteries in the meter, an environmentally-friendly feature that reduces the need for battery disposal.”*

## Condition

The majority (90%) of the single parking meters are in good condition, and the remaining 10% are in fair condition. Fair condition means that the meters are old, but spare parts are still available to keep them serviceable. As a result of a pay station replacement plan that started in July 2009, 100% of the pay stations are now in fair or better condition.

With current pay station technology, the machines are able to send electronic notification of meter problems directly to the meter technicians, reducing the amount of time during which a machine is not operating properly.

Pay stations have an estimated ten-year life expectancy. However, replacement of pay stations is scheduled when it is no longer cost effective to maintain them or when the technology becomes significantly outdated.

Parking sign and pavement marking maintenance is performed by PBOT's Maintenance Operations. Signs and pavement markings help manage turnover, maintain uniform parking space lengths, and allow for enforcement of the system.

## Goal

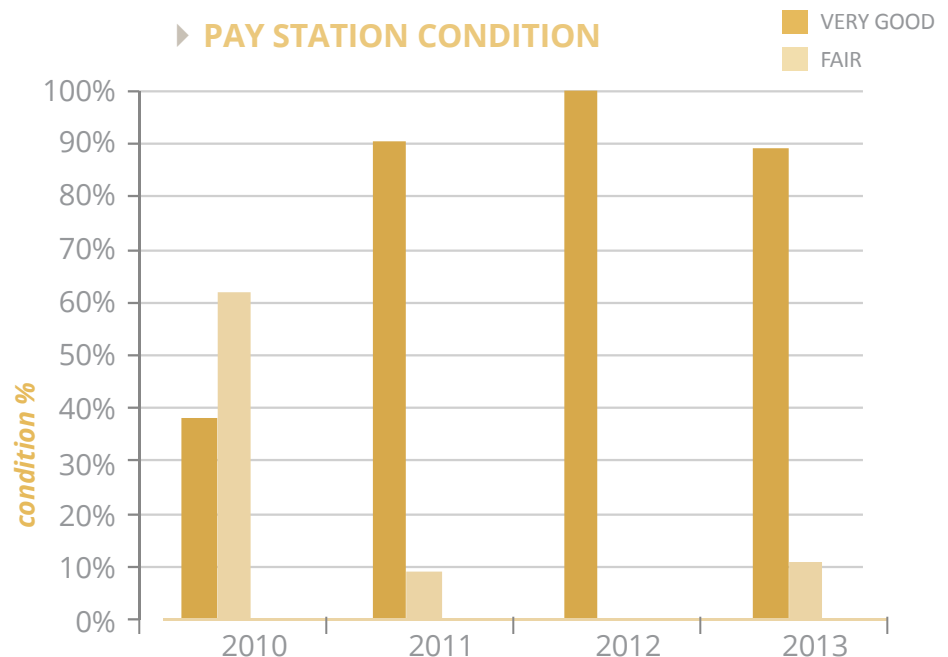
Customers expect that pay stations will be in working order so that they can purchase parking receipts during hours of operation. PBOT expects pay stations to function to manage turnover and generate revenue. Older pay station machines, nearing the end of their life, might perform less reliably. The goal is to maximize reliability of service.

PBOT's target is for no more than 20% of the pay station system to be near the end of its useful life (8 years or older, given the 10 year industry estimate of lifespan). A replacement program was completed in August 2011.

## Unmet Need

*What do we need to improve the parking meter system?*

Currently there is no unmet need for pay stations as all machines are still within their useful life. PBOT developed a five-year replacement plan for older pay stations (first installed in 2002) which were no longer cost effective to maintain. The second year of the replacement plan was completed in June 2010 and the replacement program was completed in August 2011. Gas tax revenues are currently being set aside to pay for the future replacement needs of the existing pay stations.



## Accomplishments

✓ City Council approved creation of the Central Eastside Meter District. Crews installed 24 pay stations within the district as part of a phased implementation.

✓ Conducted preventive maintenance as scheduled.

✓ Completed 75 work orders affecting the installation, removal, and reinstallation of 126 parking meters.

✓ Completed 16,268 service/repair calls for pay stations and 1,010 service/repair calls for single space meters. ■

## ► STATUS

	2012	2013
Single	411	410
Pay Stations	1,343	1,343
Replacement Value*	\$11.6 M	\$11.6 M

\* Confidence level of replacement value: high

## ► LEVEL OF SERVICE

	TARGET	FY 12-13
% of pay stations with less than 2 years of remaining service life	20%	5%

## ► TRANSPORTATION SYSTEM STATUS, CONDITION + VALUE

FACILITY	STATUS	REPLACEMENT VALUE	CONDITION					TOTAL UNMET NEED
PARKING METERS			VG	G	F	P	VP	
Single	410	\$333,330		90%	10%			\$0
Pay Station	1,343	\$11,235,538	89%		11%			\$0
	1,753	\$11,593,253						\$0



*“Pavement striping is prioritized according to safety needs.  
This also ensures efficient use of resources.”*





# Pavement Markings

*Pavement markings employ a uniform and recognizable system of colors, patterns, widths, symbols, and words to communicate their message. Because markings are located on the roadway, directly in line with the travel path, they are a highly visible safety device.*

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Pavement markings are an important communication tool for road users. They help guide drivers and bicyclists by indicating when passing is allowed and warning of upcoming road conditions. Crosswalk markings help pedestrians cross the street more safely. Pavement markings employ a uniform and recognizable system of colors, patterns, widths, symbols, and words to communicate their message. Because markings are located on the roadway, directly in line with the travel path, they are a highly visible safety device. The pavement marking system is comprised of longitudinal lines (parallel to traffic), transverse lines (across traffic lanes), words ("Only," "Bus," "Bike," etc.) and symbols (arrows, railroad).

The number of pavement markings and amount of striping will change as improvements are made to the system. These improvements include removing or installing pavement markings for functions such as new bike lanes, new crosswalks, and other safety improvements.

## Condition

Painted markings can last six months to a year.

Since a majority of the streets are repainted on an annual basis, condition monitoring is not conducted. Stripes are a key safety feature for motorists, cyclists and pedestrians. Not all lines need to be restriped each year, but maintenance crews prioritize striping on centerlines, fog lines, and bike lanes.

PBOT is improving the system for tracking crosswalk maintenance. A prioritization plan for crosswalk repairs is now in place.

## Goal

The goal is to restripe painted lines at least two times per year. The lines that receive two new coats in a year - or sometimes more - contribute to an annual restriping rate that is greater than 200%.

*"Stripes are a key safety feature for motorists, cyclists and pedestrians. Not all lines need to be restriped each year, but maintenance crews prioritize striping on centerlines, fog lines and bike lanes."*

## Unmet Need

*What do we need to improve our pavement marking system?*

An additional \$5 million beyond what is currently budgeted is needed in the next 10 years to bring pavement markings to fair or better condition. Many pavement markings, especially crosswalks, are faded, incomplete, or in need of replacement.

## Prioritization

Due to a limited budget and the seasonality of striping work, which restricts the amount of time maintenance can be conducted, pavement striping is prioritized according to safety needs. This also ensures efficient use of resources. Center lines, traffic lane

lines, bike lanes, and fog lines are included in these considerations.

A prioritization process also exists to guide the use of expensive thermoplastic. Thermoplastic markings are prioritized for use on roads such as high crash corridors. Thermoplastic has a longer service life and needs to be replaced less frequently than paint; however, it is a costlier application. Not all lines can or should be restriped and maintained with this material. For example, older pavement requires additional surface preparation that may include grinding out of existing striping and/or the application of additional primer to ensure good adhesion.

In the last year, the amount of thermoplastic striping decreased

and the amount of paint striping increased. Although the daily cost for paint striping and thermoplastic striping are about the same, paint can be applied much more efficiently than thermoplastic, which helps optimize crew hours.

The application of thermoplastic striping is now limited to new pavement and locations where narrow or winding roadways with high traffic volumes present a safety concern. High-volume arterials that experience significant wear to their lane striping are also a priority for thermoplastic lines. The remainder of the striping is done with paint. This balances the high cost/higher durability option against the low cost/lower durability option to optimize overall striping costs. ■

### ► PRIORITIZATION FOR LONGITUDINAL MARKING ACTIVITIES

*\*Striping will still follow pavement projects as the first priority*

1	<p>High crash corridors and streets with safety issues:</p> <ul style="list-style-type: none"> <li>► First within the Streets of Citywide Significance (SCS) and then non-SCS streets. This includes bike lanes</li> <li>► Life safety routes that are on curvy roads: Sam Jackson; Terwilliger; Germantown)</li> </ul>	<p>High crash corridors; streets where engineering judgment indicates higher number of crashes; and streets identified through various crash data elements.</p> <p>Streets with tight curves and narrow alignments.</p>
2	<p>Arterial/collector roads with high volume traffic (transit, freight, vehicle, bike)</p> <ul style="list-style-type: none"> <li>► Follow pavement prioritization for SCS streets</li> <li>► Includes bike lanes</li> <li>► Curvy roads</li> </ul>	<p>The streets of citywide significance map that outlines the prioritization for pavement work will be utilized to determine which arterial/collector roads will be used first.</p> <p>Streets with tight curves and narrow alignments.</p>

## Accomplishments

- ✓ Recognizing the generally poor condition of crosswalks city-wide, PBOT emphasized refurbishing crosswalks city-wide and began tracking the number of crosswalks maintained. This new information will help inform managers and supervisors about the effectiveness of maintenance priorities and policies.
- ✓ The total miles of longitudinal striping ("long lines") continues to grow from previous years, reflecting the effectiveness of policies and priorities and work management improvements. Total accomplishment measurements in this area show that the equivalent of 203% of the inventory was striped, indicating at least a double-coat of paint on most streets, or in some cases three coats on some streets and only one on others.
- ✓ Equipment and software license was purchased to equip and test real-time

GPS and production monitoring. This allows position, stripe type and detailed information on line thickness, vehicle speed, color and pattern to be downloaded from the vendor's server. This information is then mapped over the striping inventory to provide location and productivity information. The ultimate goal is to reduce paper entry and/or double-entry of striping data as well as to monitor striping progress throughout the year. ■



*A striping crew repainting double yellow lines*

## ► PAVEMENT MARKING OUTPUTS

	FY 09-10	FY 10-11	FY 11-12	FY 12-13
Pass-Miles of Lines Painted	1,161	1,548	2,144	3,309
Pass-Miles of Thermoplastic Lines Striped	56	64	95	71
Square Feet of Words & Symbols Maintained	52,598	30,077	67,467	73,864
Est. Number of Words & Symbols Maintained	4,046	2,314	5,190	4,401
Lineal Feet of Hot Plastic Maintained	29,880	1,800	13,829	14,801
#of Parallel Line Crosswalks Maintained	-	-	-	273
# of Ladderbar Crosswalks Maintained	-	-	-	173

## ► STATUS

	2012	2013
Center Lines (pass mile)*	734 pass-miles	729 pass-miles
Traffic Lane Lines (pass mile)	99 pass-miles	100 pass-miles
Bike Lane Lines (pass mile)	566 pass-miles	563 pass-miles
Edge Lines (pass mile)	279 pass-miles	272 pass-miles
Crosswalks	4,696	4,617
Stop Bars	2,812	2,696
Symbols & Words	20,018	20,489
Island Markings	649	558
Parking	2,150	2,269
Replacement Value**	\$8.8 M	\$8.9 M

\* Pass mile is a continuous 4" wide line, one mile in length

\*\* Confidence level of replacement value: moderate

## ► LEVELS OF SERVICE

	TARGET	FY 12-13
% of crosswalks maintained on an annual/biannual basis with paint or with thermoplastic	TBD	TBD
% of lines restriped on an annual/biannual basis with paint or with thermoplastic	100%	203%

## ► TRANSPORTATION SYSTEM STATUS, CONDITION + VALUE

FACILITY	STATUS	REPLACEMENT VALUE	CONDITION					TOTAL UNMET NEED
PAVEMENT MARKINGS			VG	G	F	P	VP	
Center Lines	729 pass-miles	\$719,362			50%	50%		\$359,681
Traffic Lane Miles	100 pass-miles	\$198,181			50%	50%		\$99,091
Bike Lane Lines	563 pass-miles	\$1,115,762			50%	50%		\$557,881
Edge Lines	272 pass-miles	\$539,054			50%	50%		\$269,527
Crosswalks	4,617	\$2,815,595			50%	50%		\$1,407,797
Stop Bars	2,696	\$245,135			20%	80%		\$196,108
Symbols and Words	20,489	\$2,485,737			30%	70%		\$1,740,016
Island Markings	558	\$268,265			70%	30%		\$80,480
Parking	2,269	\$583,843			25%	75%		\$437,882
		\$8,970,934						\$5,148,463







*“PBOT's pavement maintenance policy is to carry out the right treatment in the right place, at the right time. This means prioritizing early-stage repairs that can keep the roadway from falling into poor or very poor condition.”*



# Pavement System

*The Portland Bureau of Transportation is responsible for maintaining 4,827 lane miles of paved roads, of which sixty percent are local roads and forty percent are collector and arterial streets.*

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The purpose of Portland's pavement system is to move people, goods and services safely and efficiently through the City. The system must balance the requirements of motor vehicles, transit buses, freight, pedestrians, bicyclists, light rail and streetcars to meet the needs of the entire community.

The Portland Bureau of Transportation is responsible for maintaining 4,827 lane miles of paved roads, of which 60 percent are local roads and 40 percent are collector and arterial streets.

► *Local streets:* Streets with a low volume of traffic and low speeds. These streets do not contain bus routes, but provide neighborhood access to larger streets. Most people live on local streets, which are also called neighborhood or residential streets.

► *Collector streets:* Streets with a higher volume of traffic than neighborhood streets. Collectors provide access from neighborhood streets to arterials. These streets may contain some bus and freight routes.

► *Arterial streets:* Streets that serve major city centers and have the highest volume of traffic. Arterials carry the majority of traffic entering, leaving, and moving across the City. These streets also carry mass transit and freight.

► *Unpaved roads:* Streets not built to City standards and therefore not maintained by the Portland Bureau of Transportation. Once upgraded through the Local Improvement District process or another mechanism, these roads become the City's maintenance responsibility.

*“The system must balance the requirements of motor vehicles, transit, buses, freight, pedestrians, bicyclists, light rail and streetcars to meet the needs of the entire community.”*



## ► STATUS

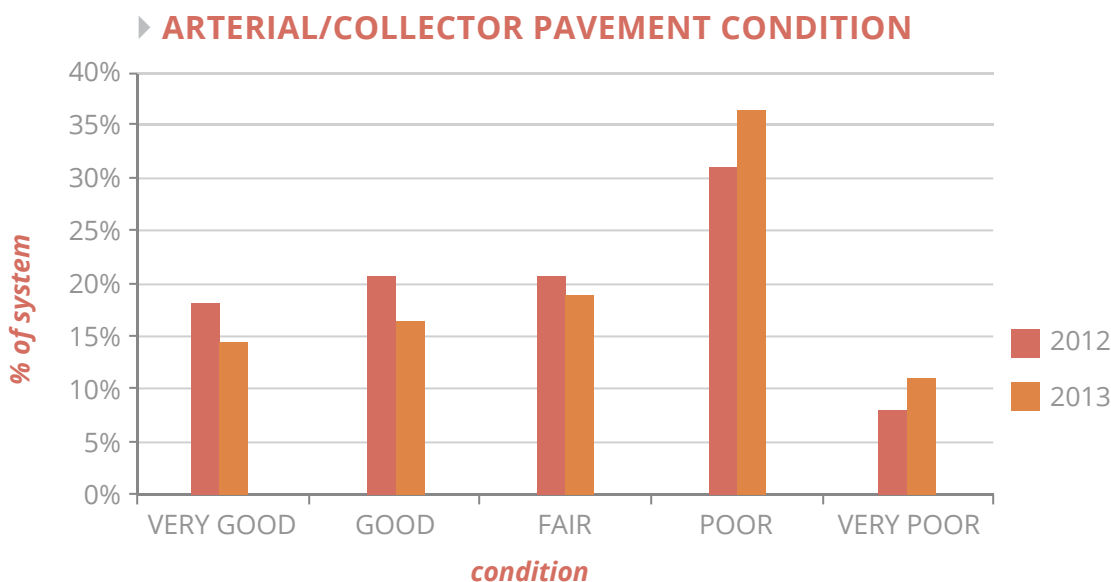
	2012	2013
Paved Streets	4,842 lane miles*	4,827 lane miles
► Arterial/Collector	1,871 lane miles	1,865 lane miles
► Local	2,971 lane miles	2,962 lane miles
Unpaved Street	59.5 centerline miles	56.8 centerline miles
Replacement Value**	\$4.8 B	\$4.8 B

\*Lane miles are computed by multiplying street length by the number of lanes in the street. For example, one mile of four-lane street equals four lane miles. Decreases in lane miles are due to increased accuracy of asset tracking over 2011/2012.

\*\* Confidence level of replacement value: Moderate.

## Condition

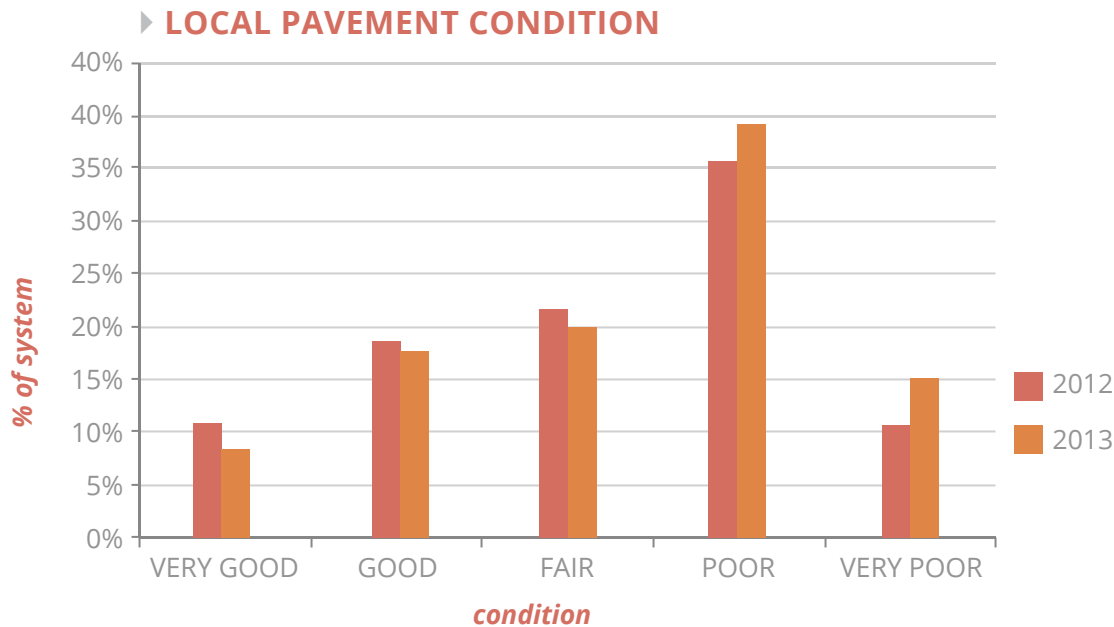
PBOT uses the Metropolitan Transportation Commission's Pavement Condition Index (PCI) methodology to assess the state of Portland's streets. This is a visual rating methodology used to score each street segment on a scale of 0-100 (worst to best). A PCI of 65 or higher translates to a condition of "fair" or better. A PCI below 40 represents very poor condition. (See Appendix A for a rating scale and definitions.)



## Goal

By targeting a low threshold for the percentage of streets in very poor condition, PBOT aims to prevent more streets from falling into the most expensive category of repair or replacement. When the desired goals are achieved, the roadway system will be at a condition at which the roadways are most cost effective to maintain.





## Unmet Need

*What do we need to improve our pavement system?* A gap exists between the current road condition and PBOT's goals. To determine what it would take to reach these goals, each repair type for pavement defects is assigned a dollar figure. These figures are incorporated into a formula that calculates how much money is needed over a ten-year period to bring the pavement condition up to the desired level.

### ► LEVELS OF SERVICE

	TARGET	BASELINE
ARTERIAL/COLLECTOR PAVEMENT		
% of pavement with a PCI of 65 and above — equivalent to fair or better condition	80%	52%
Maximum % of pavement system which will be tolerated below a PCI of 40 (very poor)	2%	11%
LOCAL PAVEMENT		
% of pavement with a PCI of 65 and above — equivalent to fair or better condition	70%	46%
Maximum % of pavement system which will be tolerated below a PCI of 40 (very poor)	11%	15%

## ► UNMET NEED

DOLLARS NEEDED TO ACHIEVE THE LEVELS OF SERVICE PER YEAR FOR TEN YEARS	FY 12-13
Unmet Need: Arterial/Collectors	\$47.6 M
Unmet Need: Local	\$44 M
Total Unmet Need	<b>\$91.6 M</b>

To meet the condition targets set for arterial and collector streets (80% in fair or better and no more than 2% in very poor condition) will take \$47.6 million per year for ten years. To meet the target level of service for local roads will require \$44 million per year for the next ten years.

Due to insufficient funding for transportation maintenance and operations, City Council passed a policy in 2009 that eliminated all paving work on local streets. This means that 2,962 lane miles of local roads, or 60% of the pavement system, received little more than basic pothole patching. City Council reversed the policy in May of 2013, restoring PBOT's ability to maintain local streets in accordance with the bureau's policy of prioritizing preventive maintenance.

We now face two scenarios. PBOT's current pavement preservation budget is \$11.8 million per year (which includes \$4.1 million of one-time funds for FY 13-14). If that \$11.8 million funding level remains the same for the next ten years, we will see the condition of the pavement system decline. Under this

scenario, the amount of arterial and collector streets in very poor (or failed) condition will increase from 11% to 22.5%. The amount of local roads in very poor condition will increase from 15% to 37.4%. This decline would happen because not enough money would be invested in appropriate pavement management. However, if we make the recommended investment of \$91.6 million per year in the pavement system over the next 10 years, we will be able to keep a significant number of streets from falling into very poor condition. This translates into future cost savings.

### Prioritization

Despite funding and resource challenges, PBOT is prioritizing the available maintenance funds to maximize effectiveness.

PBOT's pavement maintenance policy is to carry out the right treatment in the right place at the right time. This means prioritizing early-stage repairs that can keep the roadway from falling into poor or very poor condition. As shown in the "Cost of Deferred Street

Maintenance" illustration, it costs ten times more to rebuild a road that has fallen into very poor condition than to carry out renovations while the road is still in the fair to good stage.

The type and frequency of required maintenance is different for local streets than for collectors and arterials. Collectors and arterials carry freight and public transit vehicles and are heavily used by citizens as they travel through the City. These streets deteriorate more rapidly than local streets due to their heavy loads, and their failures tend to be deeper and may affect the base structure and therefore require more expensive fixes.

Local streets have very little loading and show signs of distress primarily from environmental impacts (weathering and oxidation) on the asphalt. Deterioration tends to occur on the surface, so sealing the cracks and rejuvenating the surface is usually an adequate fix. Lower-traffic roads are the main targets of PBOT's new fog seal program. In 2012 PBOT began testing fog sealant, a paving material that protects the road surface at a significantly lower cost than grinding

up old asphalt and repaving. Applying fog sealant costs only \$7,500-\$10,000 per mile or less, compared to approximately \$150,000 per mile for a traditional grind and pave job. Made up of a liquid layer of asphalt, recycled tires, and grit, fog seal is sprayed onto clean pavement where it hardens as it dries, protecting the roadway from weathering for an estimated 3-5 years. PBOT began fog sealing throughout the City in July 2013, focusing on lower-traffic roads. Work will continue on warm, dry days until PBOT reaches or surpasses its goal of fog sealing 50 miles of roads by the end of fiscal year 2013-2014.

When it comes to more extensive maintenance, PBOT chooses which streets to repair first based on "Streets of Citywide Significance" (SCS) mapping. SCS are travel corridors whose high traffic volume across all modes (freight, transit, motor vehicles, pedestrians and bicycles) makes them especially critical to the system. The prioritization is necessary

because the scope of resources needed to maintain transportation infrastructure greatly exceeds resources available.

## Pavement Priorities for Determining Preventive Maintenance and Capital Rehabilitation

The following table illustrates the methodology that was used to determine which streets are Streets of Citywide Significance.

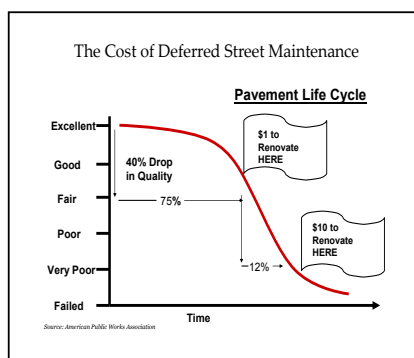
✓ Completed a multi-year contract pavement project (major rehabilitation) on Sandy Blvd from NE 47th to 82nd avenues. The project included 10 lane miles of paving.

✓ Filled 8,267 potholes, 37% of which came from requests to the Pothole Hotline. ■

## Accomplishments

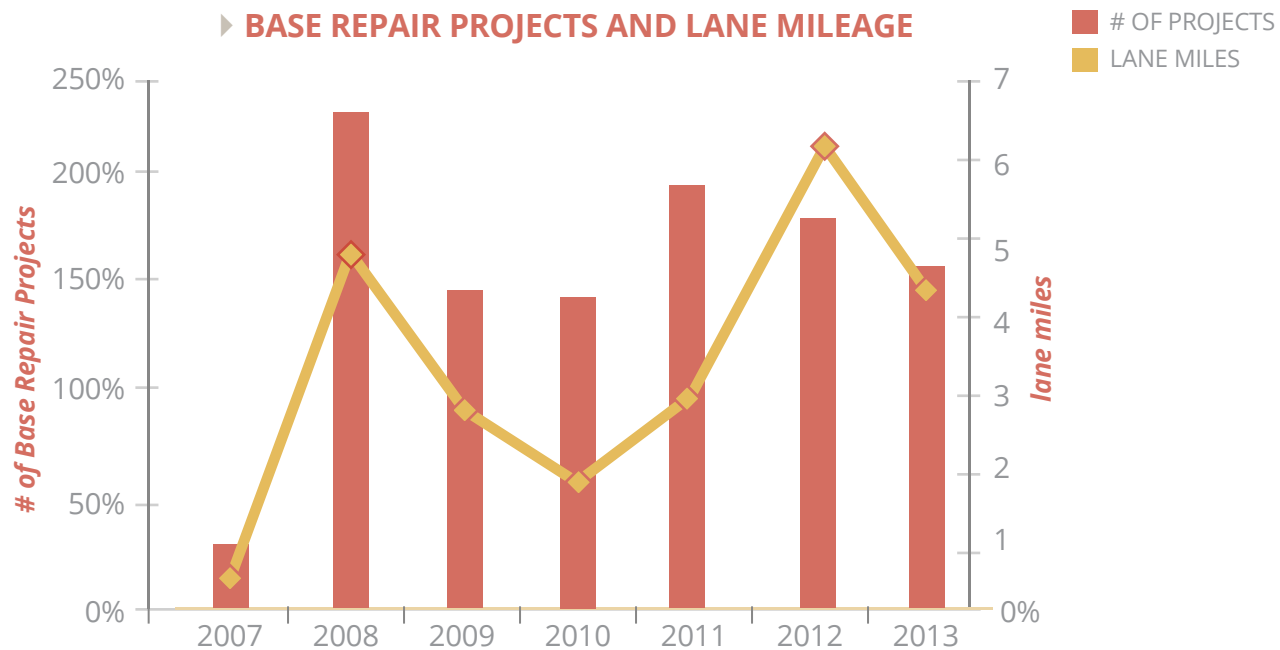
✓ Conducted street preservation activities (grind and pave) on approximately 33.8 lane miles of roads.

✓ Did base repair in 154 locations which totaled 4.03 lane miles.



Source: American Public Works Association

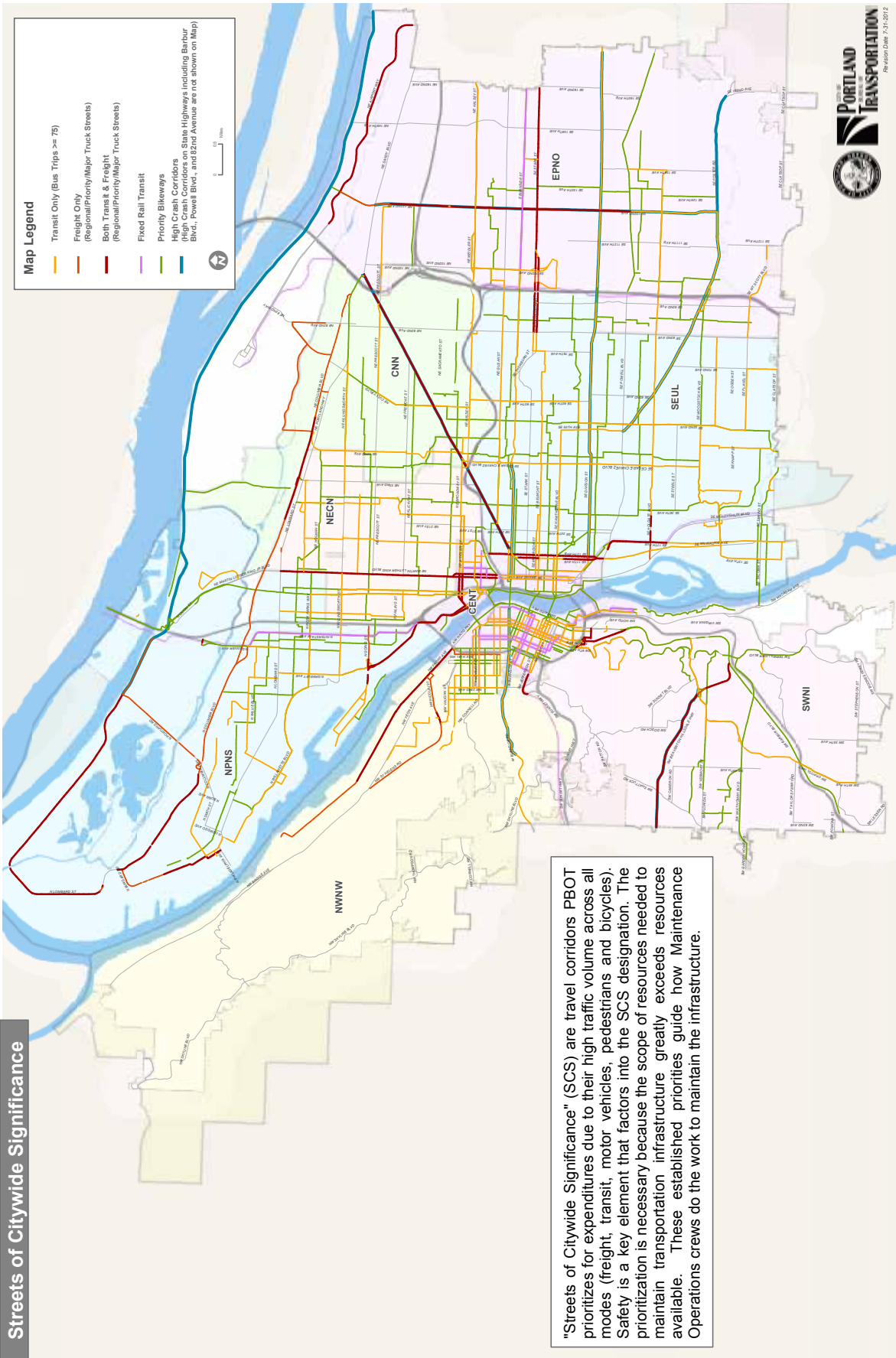
PRIORITIZATION CATEGORY	LANE MILES
Transit Trips > 75 Trips + Freight	219
Buses > 300 Trips	45
Freight Only	82
Buses 151 - 300 Trips	240
Buses 75 - 150 Trips	273
Neighborhood Greenways	172



► **TRANSPORTATION SYSTEM STATUS, CONDITION + VALUE**

FACILITY	STATUS	REPLACEMENT VALUE	CONDITION					TOTAL UNMET NEED
PAVEMENT			VG	G	F	P	VP	
Arterial/Collector	1,865 Lane miles	\$2,496,425,499	15%	18%	19%	37%	11%	\$476,000,000
Local	2,962 Lane miles	\$2,346,577,348	8%	18%	20%	39%	15%	\$440,000,000
Unpaved Streets	56.8* Centerline miles	N/A					100%	N/A
		\$4,843,002,847						\$916,000,000







*“Maintenance occurs primarily in response to police reports of crashes that have damaged barriers, citizen complaints, or reports from field crews of barriers in need of maintenance.”*

# Roadside Barriers

*Roadside barriers consist of guardrails and attenuators and are an important component of roadway safety. The presence of guardrails helps slow down and redirect vehicles that stray from a travel lane.*

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Roadside barriers consist of guardrails and attenuators and are an important component of roadway safety. The presence of guardrails helps to slow down and redirect vehicles that stray from the travel lane, in addition to protecting vehicles and their occupants from steep slopes and other hazards beyond the barricade. Attenuators (e.g. the striped part of the barrier shown at right) provide protection from a point or “spear-like” hazard, where a longitudinal barrier like a guardrail is not as effective. Roadside barriers also protect property, such as buildings and bridges, by slowing or stopping a moving vehicle before a structure is hit.

Due to budget cuts, the Portland Bureau of Transportation does not have a preventive maintenance program for guardrails and attenuators. Currently, only reactive maintenance is conducted on barriers. This maintenance occurs primarily in response to police reports of crashes that have damaged barriers, citizen complaints, or reports from field crews of barriers in need of maintenance.

## Condition

Monitoring of guardrail condition commenced in Fall 2012 and 50% of the system was assessed. More condition information about the roadside barrier system will be available once the rest of the system is rated. A complete inventory was done in the early 1990's to identify the quantity and location of guardrails owned by PBOT.

When crews repair damaged guardrail, they replace it at a level commensurate to the remainder of the undamaged guardrails. Where guardrail is damaged more frequently, engineers and maintenance staff assess the cause of the damage and the guardrail installation. This may result in having the guardrail redesigned or adding reflectors to increase visibility.

*“Guardrails are an important element for roadway safety. Roadside barriers also protect buildings and bridges, by slowing or stopping a moving vehicle before a structure is hit.”*

## Goal

Roadside barriers are key safety features for the transportation system and users of the roadway rely on them. A goal of maintaining 100% of attenuators in fair or better condition is reasonable given that the City owns and maintains 26 units. A target of 90% of guardrails in fair or better condition is comparable with other municipalities and, given appropriate levels of funding, is a realistic target.

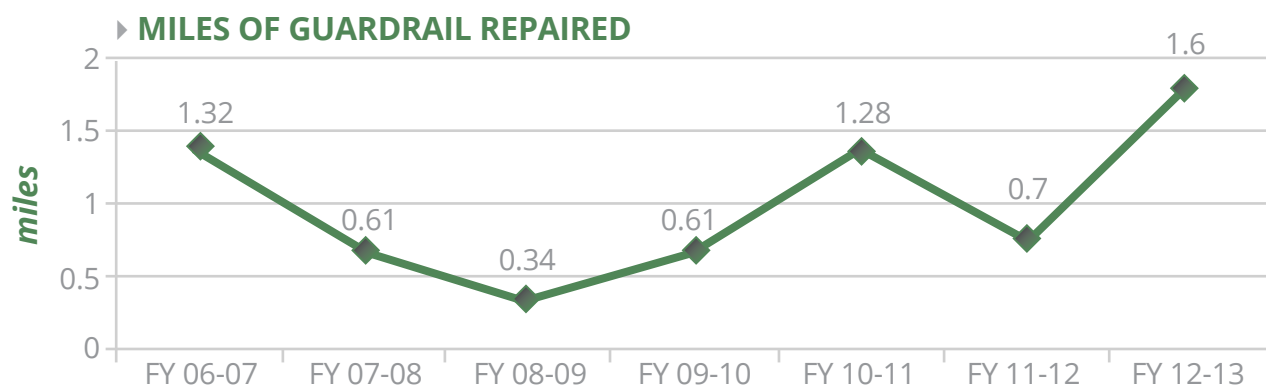
high-level assessment of guardrail condition. Guardrail needing immediate attention received preventive maintenance. Currently, the unmet need for guardrail and attenuators is not calculated, but PBOT hopes to develop these financial calculations in the future once the condition assessment has been completed.

## Accomplishments

✓ Installed and repaired 1.6 miles of guardrail in FY 2012-2013. Created mobile data collection process for guardrail condition and began collecting condition data. ■

## Unmet Need

In fiscal year 2012-2013 PBOT spent \$177,652 on guardrail repairs. PBOT anticipated recovery of approximately \$54,000 from the insurance companies of the individuals who collided with the guardrail. PBOT has undertaken a





## ► STATUS

	2012	2013
Guardrail	26 centerline miles	26 centerline miles
Attenuators	26 units	26 units
Replacement Value*	\$6.8 M	\$6.8 M

\* Confidence level of replacement value: low

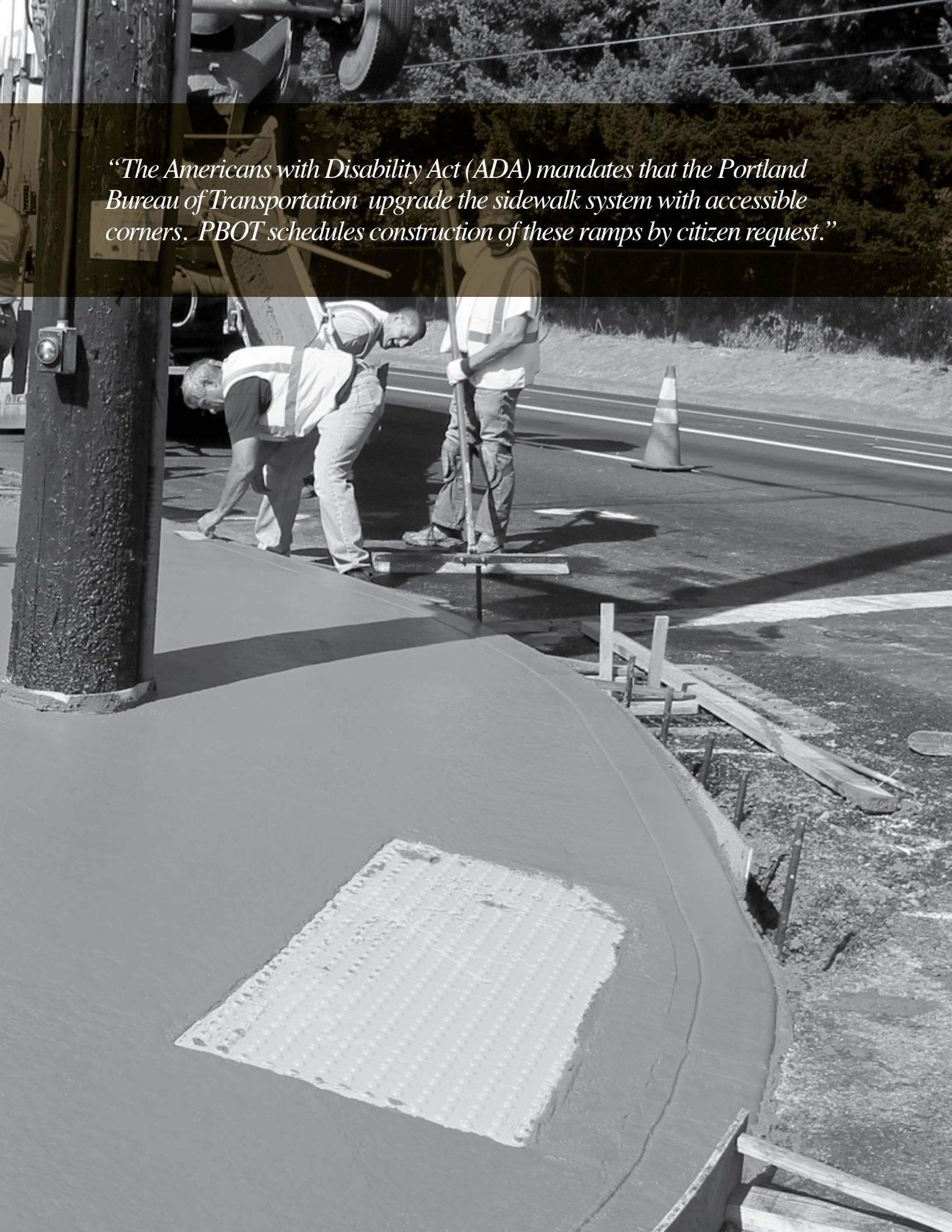
## ► LEVELS OF SERVICE

	TARGET	FY 12-13
% of traffic attenuators in fair or better condition	100%	TBD
% of guardrail in fair or better condition	90%	TBD

## ► TRANSPORTATION SYSTEM STATUS, CONDITION + VALUE

FACILITY	STATUS	REPLACEMENT VALUE	CONDITION					TOTAL UNMET NEED
ROADSIDE BARRIERS			VG	G	F	P	VP	
Guardrails	26 centerline miles	\$6,864,000			TBD			TBD

*“The Americans with Disability Act (ADA) mandates that the Portland Bureau of Transportation upgrade the sidewalk system with accessible corners. PBOT schedules construction of these ramps by citizen request.”*



# Sidewalk System

*Portland's sidewalk system is made up of sidewalks, corners, and curbs. The system provides pedestrians with a safe way to access transit, neighborhood businesses, parks, and schools. With Portland's 2,250 miles of sidewalks, you could walk from Portland to Tampa, Florida!*

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Portland's sidewalk system is made up of sidewalks, corners, and curbs. The system provides pedestrians with a safe way to access transit, neighborhood businesses, parks, and schools. Curbs not only mark the edge of the pedestrian network, but also channel water to the drainage system, which helps preserve street pavement.

Per City code, property owners are responsible for constructing, reconstructing, maintaining and repairing the sidewalks abutting their property.

The Americans with Disability Act (ADA) mandates that the Portland Bureau of Transportation (PBOT) upgrade the sidewalk system with accessible corners. PBOT schedules construction of these ramps by citizen request, as well as annual programmatic reconstruction of corners. Corners in poor condition or in need of enhanced pedestrian access receive priority. Sidewalk inspectors identify hazardous corners that need maintenance.

## Condition

With proper maintenance and renewal, sidewalks and corners last about 40 years and curbs about 60 years. Due to budget reductions, the inspection of sidewalks is limited to following up on trip and fall complaints from citizens. Sidewalks with raised sections or openings that pose a trip hazard must be repaired. Bureau inspectors assess sidewalks and notify the property owner of needed repairs (a process called posting). Business and residential property owners must repair any posted deficiencies that make the sidewalk unsafe. For condition definitions, see Appendix A.

The City's ADA Transition Plan aims to build 700 to 1,000 ADA compliant corners each year. ADA compliance changes over time as new standards are adopted. When these standards change, PBOT changes the building standards to stay in compliance. In total, 47% of the sidewalk system has corner ramps, constructed to meet the ADA requirements of their day.

*“With proper maintenance and renewal, sidewalks and corners last about 40 years and curbs 60 years. Curbs not only mark the edge of the pedestrian network, but also channel water to the drainage system, which helps preserve street pavement.”*



The budget for the curb repair program was eliminated in fiscal year 2006-2007, which means that no maintenance is conducted. Current estimates rate 78% of curbs in fair or better condition. Substandard curbs impact drainage into the sewer system and allow for water to infiltrate the street bed, impairing the integrity of the paved roadway.

## Goal

Given the ADA mandate to equip all City corners with accessible corner ramps, PBOT's target is to build ramps on 100% of the corners in the City. PBOT's target of keeping 65% of sidewalks in fair or better condition is based upon the number of postings and not the actual percentage of square yards of sidewalk in a specific condition.

Condition of sidewalks is influenced by several factors: Tree roots, which can cause damage, PBOT's ability to identify repair needs and notify (post) property owners of repairs, and the property owner's response to notification of needed sidewalk improvements.

## Unmet Need

*What do we need to improve the sidewalk system?* An additional \$228 million is needed to bring the curbs and

corners into fair or better condition. Although sidewalks are typically in the public right-of-way and owned by the City, adjacent property owners are financially responsible for construction and repairs. Similarly, developers are responsible for building or repairing sidewalks at the time of construction. The unmet need figure does not include the cost of building sidewalks where none exist. The cost to bring all corners into ADA compliance will be \$71.3 million over the next ten years. To bring the 38% of curbs that are in fair to poor condition up to good condition would cost an additional \$156.8 million over the next ten years.

## Prioritization

While working towards the target of constructing 700-1,000 ADA compliant curb ramps each year, Maintenance Operations prioritizes its work to maximize usage and benefit people with disabilities while also maintaining an equitable distribution of benefits.

Corner upgrades are prioritized for corners that lack any curb ramp. However, corners with ramps that are hazardous, in disrepair and/or considerably non-compliant with current ADA design guidelines/standards are also considered for upgrades.

Corners are built in accordance with the following guidelines.

## Accomplishments

- ✓ In FY 2012-2013, PBOT built 876 ADA-compliant corner ramps.
- ✓ 5 miles of sidewalks were built through the Capital Improvement Program and 1 mile was built by Maintenance Operations.
- ✓ 1,649 properties were inspected for sidewalk deficiencies. Of those, 1,156 were posted for repairs. ■

*Installing an ADA compliant curb ramp in Northwest Portland.*





## ► PRIORITIZATION

★	Citizen ADA requests for curb ramps made by people who use mobility devices	Address requests that are received through the PBOT Citizen ADA Request Curb Ramp Program, from citizens who use mobility devices, or on their behalf, to provide specific accessible routes based on their location and travel needs. Priority given to providing access to one's residence, place of work, government offices and facilities, places of public accommodations, and transit.
★	Existing curb ramps that present a hazard or barrier to passage	Address existing curb ramps reported by inspectors or citizens and posted as trip and fall hazards or barriers to safe passage by people who use mobility devices. These locations will be filled in on an as-received basis. They may also be incorporated into the work orders for routes identified in the categories below if along the route or in the nearby vicinity.
①	High pedestrian crash locations	Build curb ramps in areas where there are clusters of pedestrian related crashes, especially marked crosswalks without ramps.
②	High Pedestrian Use Areas	Proxy measures: 1. Central Business District. 2. Other Central City sub-districts. 3. Pedestrian Districts Citywide. 4. Arterial streets with any commercial zoning, high density zoning or Central Employment (EX) zoning. 5. Transit routes (bus and fixed rail): > 300 trips 150 – 300 trips 75 – 150 trips 6. Routes leading to High Capacity Transit stations.
③	Places with higher concentration of people with disabilities	Measures: Based on location of services for people with disabilities or where greater numbers of seniors and people with disabilities reside based on US Census data, location of accessible housing units and other sources.
④	Fill in remaining gaps in the priority pedestrian network to serve key destinations	Provide accessible routes from point A to B around the following locations: hospitals, schools, neighborhood greenways with pedestrian traffic, senior centers community centers, business/commercial centers
	Equity (Racial, Under-served populations and Geographic)	While the above categories and criteria shall first inform curb ramp location priorities, consideration should then be given to equitably distributing curb ramps. First address curb ramp disparities in areas with higher concentrations of people of color and other historically under-served populations. Then, consider an equitable distribution in terms of serving all districts of the City.

\* These categories will be addressed first. After those corners are constructed, the remaining corners will be built based upon the prioritized outlined.

## ► STATUS

	2012	2013
Sidewalks	8,833,812 square yards or 2,510 miles	8,869,556 square yards or 2,520 miles
Corners	37,813 corners 45% of corners have ramps	37,886 corners 47% of corners have ramps
Curbs	3,260 miles	3,263 miles
Replacement Value*	\$1.8 B	\$1.8 B

\* Confidence level of replacement value: high

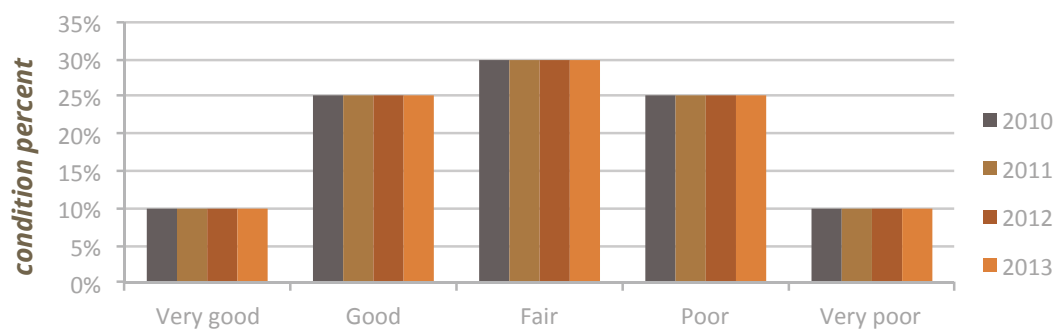
## ► LEVELS OF SERVICE

	TARGET	FY 12-13
% of corners in the City with corner ramps	100%	47%
% of guardrail in fair or % of sidewalks in fair or better condition (based on hazards)	65%	65%

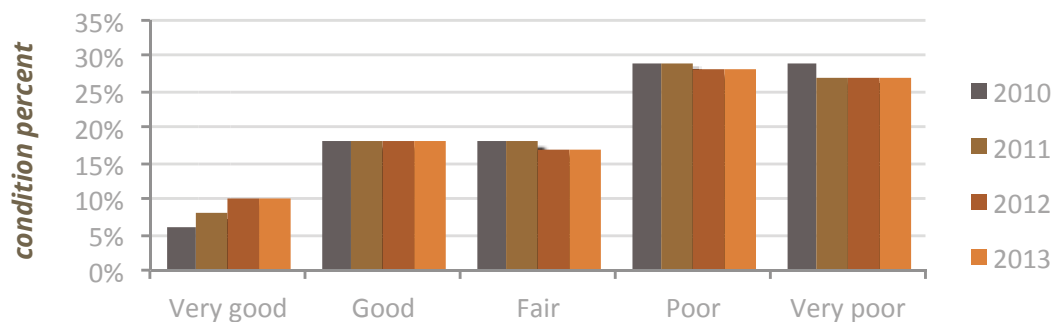
## ► TRANSPORTATION SYSTEM STATUS, CONDITION + VALUE

FACILITY	STATUS	REPLACEMENT VALUE	CONDITION					TOTAL UNMET NEED
SIDEWALK SYSTEM			VG	G	F	P	VP	
Sidewalks	8,869,556 sq yds	\$1,037,738,052	10%	25%	30%	25%	10%	N/A
Curbs	3,263 centerline miles	\$603,002,400	12%	50%	16%	12%	10%	\$156,780,624
Improved Corners	37,886	\$128,092,566	10%	18%	17%	28%	27%	\$71,362,488
Corners w/ Ramps	17,634	N/A						N/A
		\$1,768,833,018						\$228,143,112

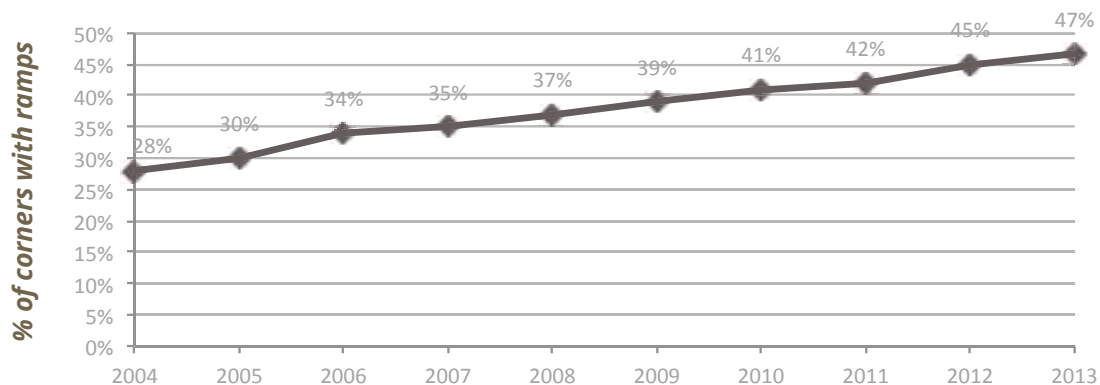
### ► CONDITION OF SIDEWALKS



### ► CONDITION OF CORNERS



### ► CURBS EQUIPPED WITH CURB RAMPS



*“Street light inventory has increased 49% in the last thirty years. Before 1954, only about a quarter of Portland’s paved streets had lights that met national standards. The advance of Portland’s street lights from 1954 to 1990 has been due to street light levies.”*





# Street Lights

PBOT provides street lighting to public streets within the City limits, according to City lighting standards. Portland General Electric (PGE) contractually provides electricity for all 55,477 city-owned street lights.

Street lighting is a public service that contributes to neighborhood livability and security. Street lighting illuminates hazards in the right-of-way, improving safety for drivers, cyclists, and pedestrians. Street lights are also important for the security of Portland's neighborhoods, as they can deter crime. Portland Bureau of Transportation partners with the Office of Neighborhood Involvement (ONI) to install street lighting in areas where ONI has identified and evaluated the need for lighting as a crime prevention tool. Local businesses also benefit when street lighting illuminates their frontages at night and makes them more visible and welcoming to customers.

PBOT provides street lighting to public streets within the City limits, according to City lighting standards. Portland General Electric (PGE) contractually provides electricity for all 55,477 city-owned street lights, and maintains 80% of City-owned street lights ("Option B" lights). PBOT maintains the remaining 20% of the system ("Option C"). Street lights

include luminaires, also called "cobra heads," as well as "ornamental lights" that provide character to a neighborhood or commercial area. PBOT uses three types of efficient lighting: high pressure sodium vapor, induction, and light emitting diodes (LED).

Street light inventory has increased 49% in the last thirty years. Before 1954, only about a quarter of Portland's paved streets had lights that met national standards. The advance of Portland's street lights from 1954 to 1990 has been due to street light levies. However, with the passage of Measure 5 in 1990, which limits property tax revenue for all local governments, the City Council cancelled the last street light levy and began to transition the street light program to General Fund support. Even with restricted funding, the number of Portland's street lights has grown by 30% since 1990.

*City lights are "Dark Sky" friendly, which means that they minimize the amount of light pollution emitted at night.*



*"In order to bring the street light system into fair or better condition, an additional \$58 million over ten years is needed. This represents the conduit, lamps, poles and street light fixtures that must be replaced, as well as the preventive maintenance that will extend the lifespan of the system."*

## Condition

Many of the City's street light luminaires were replaced in the early 1980's when mercury vapor lights were converted to high pressure sodium light. These luminaires are now reaching the end of their useful life, estimated at 30 years, and will need to be replaced. In addition to age, condition is evaluated during field inspections, with employees tracking the kind of luminaire and type of wiring system (underground vs. above ground).

Approximately 16% of the street light system is in good or very good condition. Thirty-seven percent of lights are in fair condition and the remaining 47% are in poor or very poor condition. For condition definitions, see Appendix A.

One factor affecting the condition of the lighting system is the nature of the street light cables. The cable running under much of the Central Business District is direct-burial lead-encased cable. This cable is over seventy years old, rapidly deteriorating, and located at depths varying from six inches to four feet. Approximately four miles of cable need to be replaced with a maintainable conduit system.

Cast iron twin ornamentals that were erected in the 1920's are still in use. A replacement program should be established, as these lights are past their useful life and have the potential to fall and cause damage or injury.

PBOT is currently converting to more efficient LED technology, which will save energy and reduce maintenance costs. A program pilot has been completed and a plan is currently in development for converting the remainder of the City's lights.

## Goal

*City Owned and Maintained - Option C:* Without additional funding for maintenance, the condition of the system will decline, due to the ageing infrastructure. This will make it increasingly difficult to meet PBOT's condition goals for its streetlights. PBOT's targets for Option C lighting reflect customer expectations that street lights function. Businesses and

residents rely on street lights to deter crime and create a sense of safety. A light that is in poor or very poor condition has a high risk of failure, which PBOT aims to minimize.

*City Owned and PGE*

*Maintained - Option B:*

Portland General Electric maintains these City-owned lights per a maintenance agreement and Tariff – Schedule 91. Many of these Option B lights are nearing the end of their useful life. The target of 80% of Option B lights in fair or better condition aims to address customer expectations as well as a reasonable tolerance of lights that are in poor or very poor condition.

### ► LEVELS OF SERVICE

	TARGET	FY 12-13
% of Option C (City owned and maintained) lights that are in fair or better condition	80%	78%
% of Option B lights (City owned and PGE maintained) that are in fair or better condition	80%	47%
% of Option C lights relamped according to the set relamping schedule of 3-5 years. (Programmatic)	100%	25%
% of time met set response time of 14 days to respond to option B & C light outages. (Programmatic)	90%	95%
% of Option B lights relamped according to the set relamping schedule of 5 years. (Programmatic)	100%	90%

## Unmet Need

What do we need improve the street light system?

In order to bring the street light system into fair or better condition, an additional \$58 million over ten years is needed. This total unmet need represents the conduit, lamps, poles and street light fixtures that must be replaced, as well as the preventive maintenance that will extend the lifespan of the system. The following table illustrates the unmet need for Option B and C lights over a 10 year period. Unmet need is defined as the amount of additional funding and resources needed to bring a given asset class to a fair or better condition and to maintain it at that condition.

## Accomplishments

- ✓ City staff organized a first-of-its-

kind Regional Street Lighting Day.

This information exchange was attended by over 150 professionals from the Portland metropolitan area and included speakers from the Governor's Office.

- ✓ Negotiations are ongoing with Portland General Electric regarding the City's proposal to convert 46,700 street lights from high pressure sodium to energy-efficient Light-Emitting Diodes (LED). PBOT anticipates achieving savings due to lower energy use and lower maintenance and operations costs. The conversion is expected to be implemented fully over the next five years beginning in December 2013. To date, more than 600 LED fixtures have been installed by City staff. ■

*Newly installed LED luminaire on Marine Drive*



*Maintenance crews at work*

## ► STATUS

	2012	2013
Option B (City owned and PGE Maintain)	44,105 lights	44,076 lights
Option C (City owned and Maintained)	11,284 lights	11,401 lights
Total	55,389 lights	55,477 lights
Replacement Value*	\$194 M	\$196 M

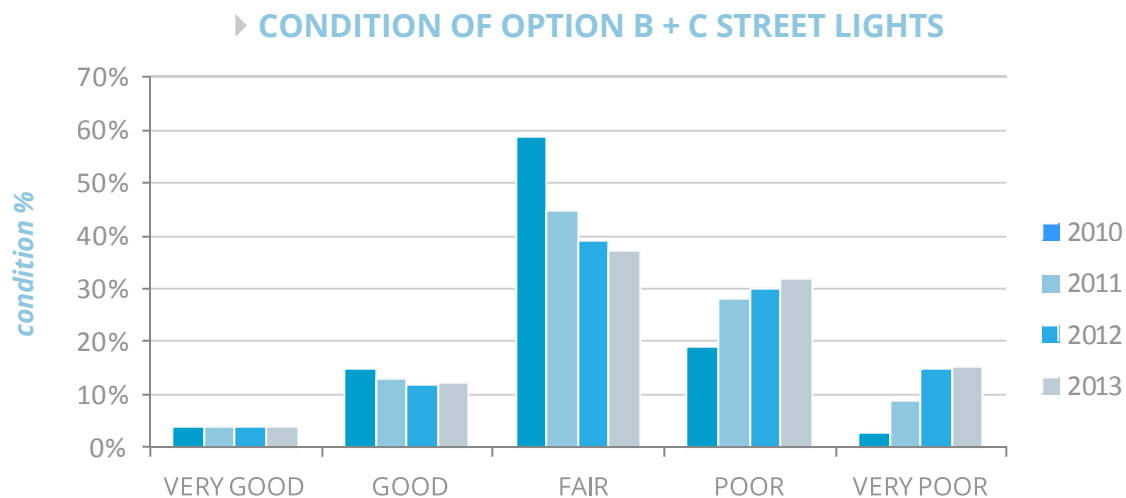
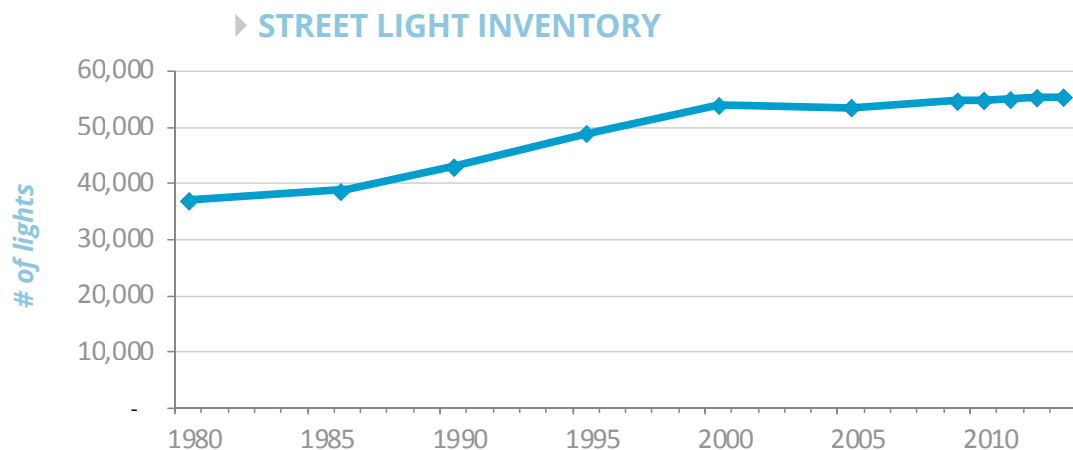
## ► LEVEL OF SERVICE

	TARGET	FY 12-13
% of Option C (City owned and maintained) lights that are in fair or better condition	80%	78%
% of Option B lights (City owned and PGE maintained) that are in fair or better condition	80%	47%
% of Option C lights relamped according to the set relamping schedule of 3-5 years. (Programmatic)	100%	25%
% of time met set response time of 14 days to respond to option B & C light outages. (Programmatic)	90%	95%
% of Option B lights relamped according to the set relamping schedule of 5 years. (Programmatic)	100%	90%

## ► TRANSPORTATION SYSTEM STATUS, CONDITION + VALUE

FACILITY	STATUS	REPLACEMENT VALUE	CONDITION					TOTAL UNMET NEED
STREET LIGHTS			VG	G	F	P	VP	
Option B	44,076	\$25,035,168	3%	8%	36%	37%	16%	\$19,165,460
Option C	11,401	\$171,015,000	8%	28%	42%	10%	12%	\$39,255,978
	\$55,477	\$196,050,168						\$58,421,438







*“Street signs are an important safety feature to direct and regulate motor vehicles, pedestrians, and bicyclists. ”*

# Street Signs

*Street signs are an important safety feature to direct and regulate motor vehicles, pedestrians, and bicyclists. PBOT maintains approximately 161,000 signs.*

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Street signs are an important safety feature to direct and regulate motor vehicles, pedestrians, and bicyclists. PBOT maintains about 161,000 signs, including regulatory signs (these include black and white speed limit, one-way street, and other notices as well as warning signs for curves or road hazards), street names, and parking signs. Design and placement of signs is regulated by the Federal Highway Administration (FHWA). Regulations are published in the Manual on Uniform Traffic Control Devices (MUTCD).

Parking signs help manage the availability of parking spots for businesses and residents. In the Central Business District, parking signs for metered spaces help generate revenue for the Bureau of Transportation.

All City signs are on sign mounts. The majority of the sign mounts are steel pipe or wood post and are maintained by PBOT's traffic maintenance crews. The remaining mounts are owned by PBOT's Street Lighting Divisions or by utility companies.

## Condition

Street signs have

a service life of approximately 12-15 years and the sign mounts about 20 years. Many of the signs must be replaced earlier due to vandalism, theft and damage from crashes. The majority of street name signs and half of parking signs are in poor condition.

One emergency crew responds year-round to reports of sign damage (i.e. graffiti, knock-downs, or theft). The crew either replaces or repairs the damaged sign or post. During the winter season there is an increase in sign repair activity since crews are not engaged in other types of tasks that require dry weather, such as striping or pavement maintenance.

PBOT conducted a pilot project to assess and monitor the condition of regulatory and warning signs. Going forward, PBOT aims to design a more comprehensive condition assessment program and provide criteria for preventive maintenance. Such work will play an important part in helping

*“Design and placement of signs is regulated by the Federal Highway Administration (FHWA). Regulations are published in the Manual on Uniform Traffic Control Devices (MUTCD).”*

PBOT meet the retroreflectivity standards mandated by the FHWA. Retroreflectivity refers to a sign's ability to reflect light from headlights back towards the vehicle operator, making the sign easier to read in dark conditions. A sample of 400 regulatory signs and warning signs (Stop signs and black and white signs) was evaluated in summer/fall of 2011. Another 527 warning/school/pedestrian/bike and street name signs were inspected in the summer of 2012. This work will continue as PBOT determines the most efficient method of inspecting signs in order to meet federal standards and improve overall sign condition.

## Goal

Regulatory signs including stop signs must be properly positioned and visible both day and night to ensure safety. PBOT's target of 100% of signs meeting retroreflectivity standards is in accordance with the federal mandate for sign visibility.

## Unmet Need

*What do we need improve Street Signs?*

An additional \$8.8 million will be needed during the next ten years to bring the City's street signs into fair or better condition. The following tables illustrate the unmet need for signs over a 10 year period. Unmet need is defined as the amount of additional funding and resources needed to bring a given

asset class to a fair or better condition and to maintain it at that condition.

## Prioritization

Due to limited funding for sign maintenance, PBOT has established a prioritization plan for replacing and fixing signs, based on their location. Signs on high crash corridors and on streets with known safety issues are at the top of the priority list, starting with those on Streets of Citywide Significance (SCS). The next signs to be maintained are those on arterials and collectors (first those on SCS streets, then on non-SCS streets), and finally, signs on local roads (particularly those on Neighborhoods Greenways, or at an intersection with

an arterial or collector street). Signs are also prioritized for maintenance by type, in the following order:

- ▶ Regulatory black and white
- ▶ Signs and stop signs
- ▶ Warning
- ▶ School/Bike/Ped
- ▶ Street name
- ▶ Parking
- ▶ Guide

## ▶ ACCOMPLISHMENTS

- ✓ Sign maintenance occurred on 9 out of 10 High Crash Corridors

OUTPUTS	FY 09-10	FY 10-11	FY 11-12	FY 12-13
# Sign Locations Maintained	15,337	19,401	21,983	13,203
Avg. No. of Locations Maintained per Day	21	24	31	24
Inspection Hours	569	742	1,650	1,215
# of Traffic Signs Maintained	7,924	9,571	10,988	7,790
# of Parking Signs Maintained	8,538	11,404	7,006	8,213
# of Street Name Signs Maintained	5,105	5,462	6,444	5,385
# of Posts Repaired, Straightened or Plumbed	2,149	2,343	1,067	1,701



## ► STATUS

	2012	2013
Street Names	39,908	39,658
Parking	55,033	56,192
Regulatory (traffic control)	54,684	55,387
Stop Signs Only	14,840	14,885
Guide Signs	9,619	9,758
Sign Mounts	74,450	78,179
Replacement Value*	\$20.6 M	\$20.4 M

## ► LEVELS OF SERVICE

	TARGET	BASELINE
% of signs in fair or better condition:		
► Traffic (warning and regulatory)	90%	65% (avg.)
► Stop Signs		80%
► Black & White (e.g. lane control, speed, etc)		38%
► School/Ped/Bike		90%
% of signs meeting retroreflectivity standards		
► Traffic (warning and regulatory)	100%	97%

## ► TRANSPORTATION SYSTEM STATUS, CONDITION + VALUE

FACILITY	STATUS	REPLACEMENT VALUE	CONDITION					TOTAL UNMET NEED
STREET SIGNS			VG	G	F	P	VP	
Street Name	39,826	\$4,858,772	3%	14%	21%	26%	36%	\$4,032,781
Parking	56,192	\$1,915,383		25%	25%	50%		\$1,436,537
Regulatory (Traffic Control)	55,387	\$3,707,806	20%	27%	18%	25%	10%	\$1,965,137
Stop Signs Only	14,885	—	22%	30%	28%	13%	7%	\$645,956
Guide Signs	9,758	\$693,347		25%	25%	50%		\$520,011
Sign Mounts	78,179	\$13,022,823						\$879,360
		\$24,198,131						\$8,833,826

*“The North-South Portland Streetcar line provides service from Good Samaritan Hospital in Northwest Portland to South Waterfront, while the Central Loop line travels from downtown Portland through the Pearl District, to the Central Eastside.”*



# Portland Streetcar

*The City contracts with Portland Streetcar, Inc., a private non-profit corporation governed by a volunteer Board, for assistance with the planning, design, construction and operation of the streetcar. The Streetcar System provides transit circulation services to the Central City, Central Eastside, and other close-in neighborhoods.*

The Portland Streetcar is owned and operated by the City of Portland through its Bureau of Transportation. The City contracts with Portland Streetcar, Inc., a private non-profit corporation governed by a volunteer Board, for assistance with the planning, design, construction and operation of the streetcar. The Streetcar System provides transit circulation services to the Central City, Central Eastside, and other close-in neighborhoods.

*Streetcar Mission:* Actively participate development or high density, mixed use environment by supporting streetcar development that is safe, reliable and cost effective.

*Service Characteristics:* The North-South streetcar line provides service from Good Samaritan Hospital in Northwest Portland to the South Waterfront, while the Central Loop line travels from Downtown Portland through the Pearl District and across the Willamette on the Broadway Bridge to the Central Eastside.

*Expansion:* In September 2012, the Portland Streetcar Loop Project extended streetcar service

to the east side of the Willamette River in support of residents and workers in the Oregon Convention District, Lloyd District, Central Eastside and in the OMSI area. The expansion added 4.5 centerline miles of track and three new streetcar vehicles. The Project was funded in part by the Small Starts Program of the Federal Transit Administration.

Through the Streetcar System, PBOT hopes to achieve the following:

- ▶ Link neighborhoods with a convenient and attractive transportation alternative.
- ▶ Fit the scale and traffic patterns of existing neighborhoods.
- ▶ Provide quality service to attract new transit ridership.
- ▶ Reduce short inner-city auto trips, traffic congestion and air pollution.

*“Portland Streetcar's mission is to be an active participant in the continuing development of a high quality, livable environment in the City of Portland by supporting streetcar developments.”*

- ▶ Encourage development of more housing & businesses in the Central City and close-in neighborhoods.

## Condition

Currently all streetcars and tracks are in good or very good condition. The maintenance facilities are also in very good condition. TriMet estimates that the average life span of a streetcar is 30 years, yet with proper monitoring and timely maintenance, the life span of the cars can be extended.

Condition assessments of Streetcars are conducted on a routine basis. Software on the cars will alert maintenance crews to issues that need to be addressed.

Preventive maintenance is conducted at regular intervals, and as with automobiles, is based upon mileage or time elapsed. The maintenance facility conducts maintenance on all the electrical, software and hardware components. Most electronic components have a lifespan of about 10 years before the technology needs modernization.

## Goal

*Streetcar condition:* For both safety and customer expectations, the condition of the streetcars must be in 100% fair or better condition. If

the car condition falls below that level, there is a great safety risk to the passengers. The cars are composed of multiple components including trucks, the body, and electrical equipment.

*Streetcar system condition:* Several of the traction and electrification components of the system are integral to safety and must be maintained at 100% in fair or better condition. The threshold for maintaining the tracks and platform is not as high because many of the components serve a purely aesthetic purpose.

*System Reliability:* PBOT aims for the Streetcar system to function at least 98% of the time during stated operational hours. This is a customer expectation as well as an internal goal.

## Unmet Need

The unmet need is meant to reflect the capital replacement needs of the streetcars and tracks over a 30 year period. Although this equipment is in good or better condition, it will need to be replaced at the end of the streetcars' useful life, which TriMet estimates to be 30 years. Currently, PBOT is reassessing the methodology by which the unmet need for the Streetcar is calculated, which is why the unmet need is shown as "to be determined" in the following table.

## Accomplishments

✓ Grand opening of new Central Loop line (part of the larger "Close the Loop" project) occurred on September 22, 2012. This line runs from PSU in Southwest Portland through the Pearl District in Northwest Portland, across the Broadway Bridge and through the Central Eastside, ending at the Oregon Museum of Science and Industry.

✓ Added three US-made cars to the Streetcar fleet, helping to boost the development of the Oregon-based streetcar manufacturing industry. ■



## ► STATUS

	2012	2013
Streetcars	10	13
Tracks	13 centerline miles	14.5 centerline miles
Maintenance Facilities	17,871 sq ft	17,871 sq ft
Replacement Value*	\$97 M	\$117 M

## ► LEVELS OF SERVICE

	TARGET	BASELINE
% of streetcars in fair or better condition	100%	100%
% of streetcar system in fair or better condition	100%	100%
% of time streetcar system is operational during scheduled hours	98%	98%

## ► TRANSPORTATION SYSTEM STATUS, CONDITION + VALUE

FACILITY	STATUS	REPLACEMENT VALUE	CONDITION					TOTAL UNMET NEED
PORTLAND STREETCAR			VG	G	F	P	VP	
Streetcars	13	\$50,773,060	46%	54%				TBD
Tracks (centerline miles)	14.5	\$66,409,200	52%	48%				TBD
Maintenance Facilities	17,871 sq ft	\$4,688,772	100%					\$0
		\$121,871,032						TBD



*“Signal synchronization reduces stop-and-go traffic, which lowers greenhouse gas emissions and helps prevent crashes.”*

# Traffic Signal System

*Traffic signals exist to move people in the City safely and efficiently. Transit, freight and travelers of all modes depend upon traffic signals for safe crossings at intersections.*

The Portland Bureau of Transportation maintains and operates a traffic signal system that includes hardware, an operating system that regulates signal timing, and the Intelligent Transportation System (ITS), which monitors demand on the system and provides real-time traveler information on select corridors.

Traffic signals exist to move people in the City safely and efficiently. Transit, freight and travelers of all modes depend upon traffic signals for safe crossings at intersections. In addition to 923 City-owned signalized intersections, PBOT owns other traffic control devices including flashing beacons, overhead crosswalk signs, island lights, and school beacons. These devices control traffic speeds or help people safely cross intersections by triggering a flashing light to alert motorists to stop.

Engineers respond to citizen complaints about safety and determine appropriate changes to traffic signals or the other devices involved. Signal synchronization reduces stop-and-go traffic, which lowers greenhouse gas emissions and helps prevent crashes. Maintenance and Operations technicians with the Signals, Street Lighting, & ITS Division conduct routine

maintenance to ensure that the components of the system are functioning properly. They also respond to emergencies, which include all-way red flashing or power outages. Each individual component is integrated to ensure a functioning and well-timed system.

## Condition

The condition of Traffic Signal hardware and controllers is based upon age. Engineers conduct condition assessments as needed. Forty-eight percent of signal hardware is in fair or better condition. The remaining 52% is in poor or very poor condition. The percentage of signals in very poor condition increased in 2012-2013 because a large number of signals hit the 30-year point, at which time their condition is classified "very poor." These components need maintenance or replacement to prevent failure. Signal hardware is estimated to last 25 years, and controllers 15 years. For condition definitions, see Appendix A. A traffic signal failure jeopardizes traffic safety and the environment. It can lead to rear-end collisions and hinder the

***"PBOT owns over 288 miles of communication lines (fiber optic and twisted pair cables) which enables communication between each signal and the Central Command System."***

movement of freight and emergency response vehicles. Furthermore, carbon output increases when congestion and idling time is extended.

In 2010, federal stimulus funding was used to upgrade 11% of signal controllers within the City (mostly on state-owned routes). Many of the remaining controllers are still operating with 1980s technology and need upgrading.

The Signals Division has set standards for response time associated with critical maintenance of the system. It is PBOT's goal to respond to traffic signal requests within 48 hours and to emergencies within two hours. These response times are met 98% of the time.

## Goal

The signal system condition target of 80% of signal hardware in fair or better condition was set based upon safety considerations and expectations of system users. If the signal system is in fair or better condition, then outages and delays should be minimized.

## Unmet Need

*What do we need to improve traffic signals?*

An additional \$183 million, over ten years, is needed to bring traffic signals (hardware and controllers) and other equipment into good condition.

The following table illustrates the unmet need for traffic signals over a 10 year period. Unmet need is defined as the amount of additional funding and resources needed to bring a given asset class to a fair or better condition and to maintain it at that condition. PBOT invests \$229,000 per year to improve and maintain the traffic signals, but not all of the preventive maintenance and replacement needs for the system are being met. This underinvestment leads to a continual decline in the condition of the signal system.

Enhancements for pedestrian crossings, such as rectangular rapid flash beacons, are constructed at the request of the Traffic Investigations or Capital Project Management groups. The Signals, Street Lighting, & ITS Division lacks the resources to add new devices based purely on requests they receive.

## Prioritization

Limited funds and work hours make it necessary to prioritize repairs on the traffic signal system. A prioritization guideline has been created to direct the work of maintenance crews. Traffic signals will be repaired in the following order: First, traffic signal indications in a condition that presents a hazard, i.e. when there is not a redundant red indication at a traffic signal (in other words, a state that may lead to injury or property damage).

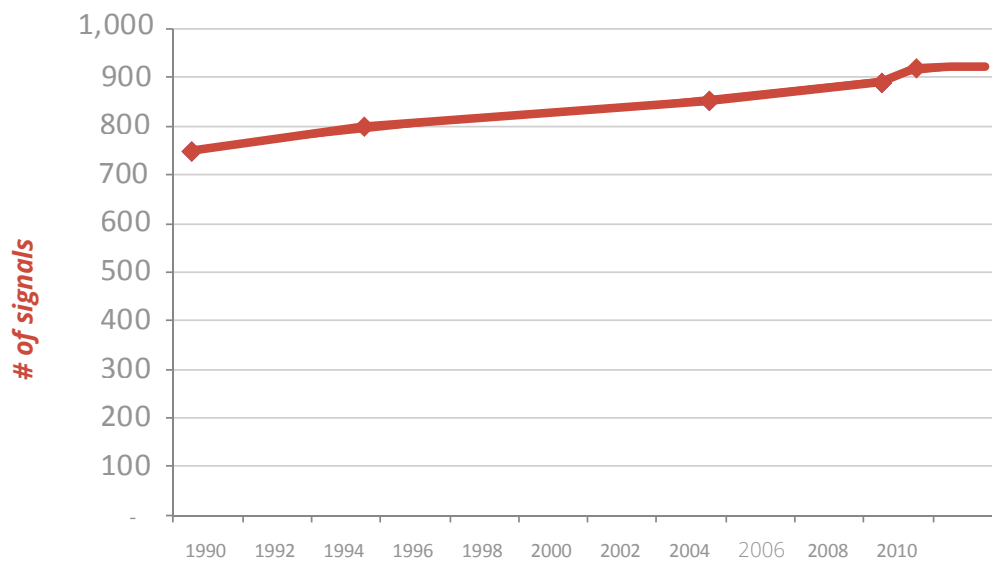
Second, traffic signals that create a "critical" condition, causing problems that could dramatically affect traffic flow (e.g. light rail signal in flashing state or preemption not working). Finally, all other traffic signal problems neither hazardous nor critical (e.g. pedestrian indication burned out on one side of an intersection).

## Accomplishments

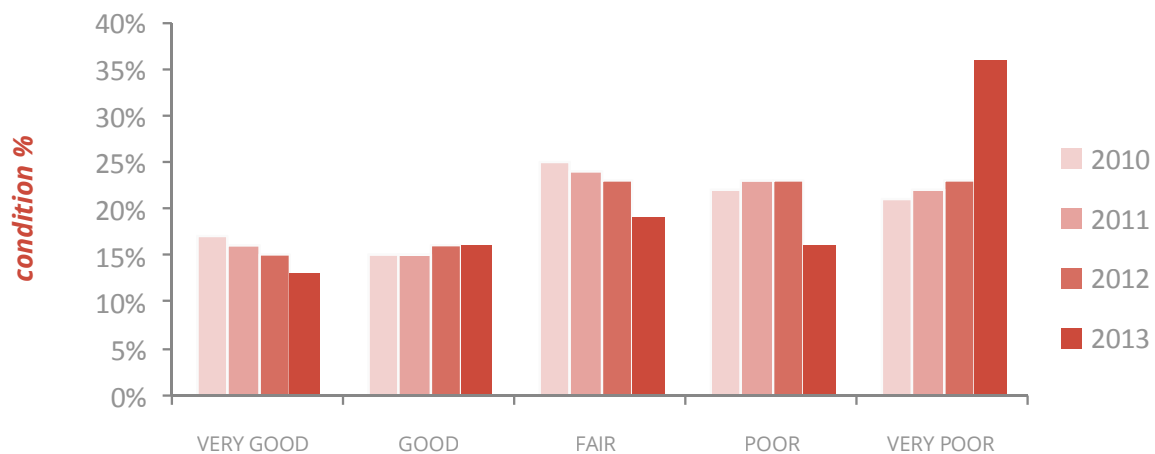
- ✓ Retimed over 138 traffic signals associated with the implementation of the new Manual of Uniform Traffic Control Devices (MUTCD) standard for accommodating slower pedestrians. This included the retiming of several traffic signals specifically for pedestrian and bicycle traffic.
- ✓ Activated new traffic signal detection confirmation lights at key crossing locations for the bikeways network as a part of the Neighborhood Greenways program.
- ✓ Reviewed traffic signal designs associated with the West Burnside/ Pearl District Traffic Safety Project.
- ✓ Inspected traffic signals associated with the Portland to Milwaukie Light Rail project. 2012 Replacement Value figure included 1,072 signalized intersections. ■



### ► PBOT OWNED SIGNALS



### ► CONDITION OF SIGNAL HARWARE



## ► STATUS

	2012	2013
Signalized traffic intersections	922	923
Other Equipment (beacons, hawk signals, overhead crosswalk signs, island lights)	280	298
ITS Equipment (cameras, variable message signs, speed reader boards, central computer system, Traffic Operations Center)	1,224	1,225
Fiber Optic/Copper Cables	288 miles	288 miles
Replacement Value*	\$290.9 M	\$273.3 M

\* Confidence level of replacement value: moderate

## ► LEVELS OF SERVICE

	TARGET	BASELINE
% of signal system in fair or better condition as measured by signal inspections (hardware)	80%	48%
Percentage of traffic signal intersections with no failures within the past year	97%	91%

## ► TRANSPORTATION SYSTEM STATUS, CONDITION + VALUE

FACILITY	STATUS	REPLACEMENT VALUE	CONDITION					TOTAL UNMET NEED
TRAFFIC SIGNALS			VG	G	F	P	VP	
Hardware	923	\$248,926,639	13%	16%	19%	16%	36%	\$175,349,818
Controllers	923	\$18,460,000	45%	16%	16%	8%	15%	\$7,100,000
Equipment (flashing beacons, overhead crosswalk, island lights)	298	TBD						TBD
ITS Equipment	1,225	\$1,191,790	91%	0%	9%	0%	0%	\$107,261
Fiber Optic/Copper Cables	288 miles	\$4,741,018	44%	41%	0%	0%	15%	\$711,153
		\$273,319,447						\$183,268,232



CENTRAL DISTRICT  
PARK

NO PARKING  
THIS BLOCK

NO PARKING  
THIS BLOCK

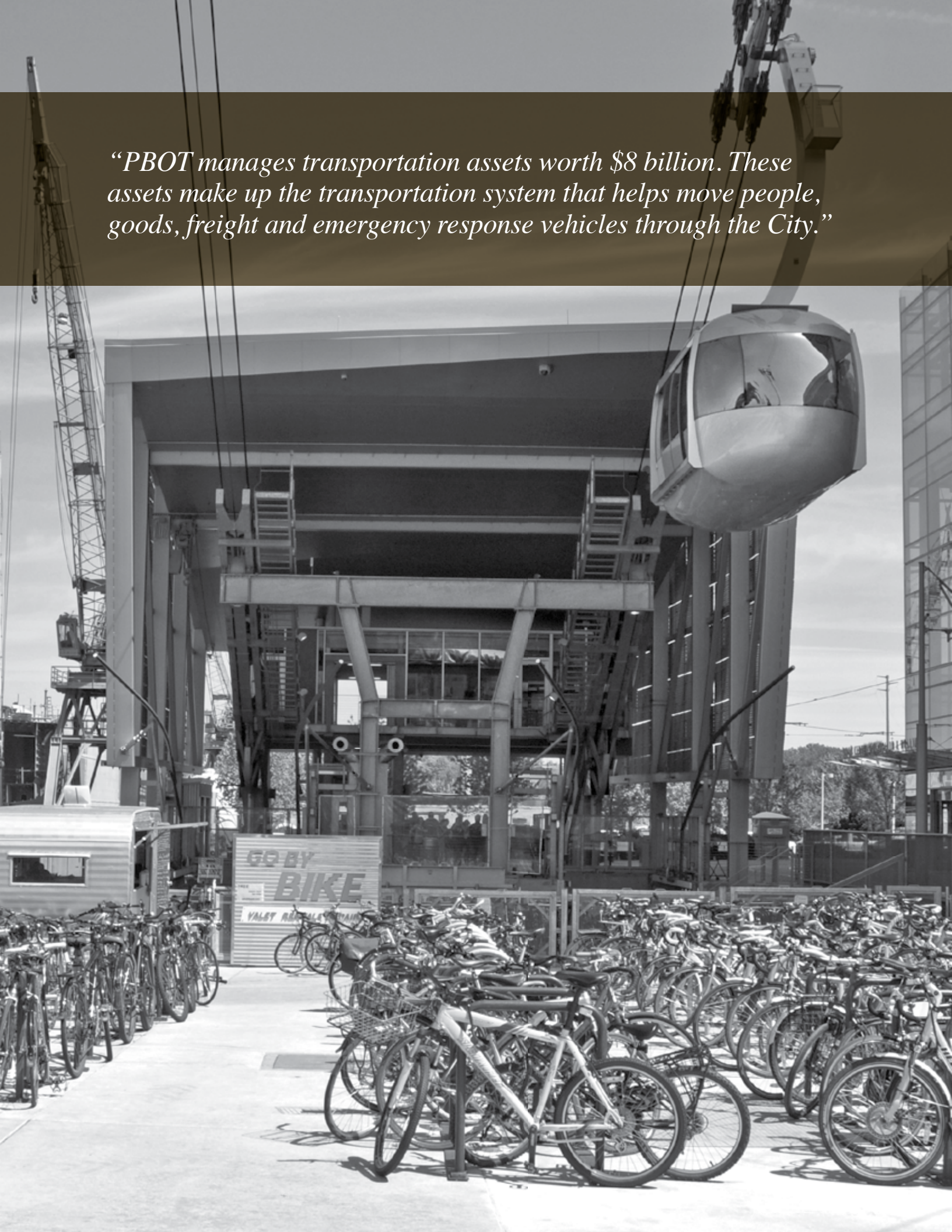
ONE WAY

PAY TO PARK

NATIONAL  
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COMING



*“PBOT manages transportation assets worth \$8 billion. These assets make up the transportation system that helps move people, goods, freight and emergency response vehicles through the City.”*





# Status, Condition, and Value

FACILITY	GASB34	STATUS	REPLACEMENT VALUE	CONDITION*						TOTAL UNMET NEED**
PAVEMENT				VG	G	F	P	VP	TBD	
Improved Street - Arterial/Collector	x	1,865 lane miles	\$ 2,496,425,499	15%	18%	19%	37%	11%		\$476,000,000
Improved Street - Local	x	2,962 lane miles	\$ 2,346,577,348	8%	18%	20%	39%	15%		\$440,000,000
Unpaved Streets		58.6 centerline miles	N/A					100%		N/A
			\$4,843,002,847							\$916,000,000
SIDEWALK SYSTEM				VG	G	F	P	VP	TBD	
Sidewalks	x	8,869,556 sq yds	\$1,037,738,052	10%	25%	30%	25%	10%		N/A
Curbs	x	3,263 centerline miles	\$603,002,400	12%	50%	16%	12%	10%		\$156,780,624
Corners										
Improved Corners	x	37,886	\$128,092,566	10%	18%	17%	28%	27%		\$71,362,488
<i>Corners with Ramps</i>	x	17,634	N/A							N/A
			\$1,768,833,018							\$228,143,112
BICYCLE NETWORK				VG	G	F	P	VP	TBD	
Bikeways		331 centerline miles	(included with pavement)		100%					TBD
STRUCTURES				VG	G	F	P	VP	TBD	
Bridges	x	157	\$382,166,069	8%	43%	32%	17%	0%		\$128,623,998
Retaining Walls	x	557	\$109,350,019	68%	22%	8%	2%	0%		\$5,039,347
Stairways	x	188	\$6,353,816	19%	58%	21%	2%	0%		\$923,180
Guardrails	x	26 centerline miles	\$6,864,000						x	TBD
Elevator		1	\$500,000	100%						TBD
Harbor Wall	x	5,134 feet	\$192,836,717		100%					\$0
			\$698,070,621							\$134,586,525
TRAFFIC SIGNALS				VG	G	F	P	VP	TBD	
Hardware	x	923	\$248,926,639	13%	16%	19%	16%	36%		\$175,349,818
Controllers	x	923	\$18,460,000	45%	16%	16%	8%	15%		\$7,100,000
Equipment (flashing beacons, overhead crosswalk, island lights)	x	298	TBD						x	TBD
ITS Equipment		1,225	\$1,191,790	91%	0%	9%	0%	0%		\$107,261
Fiber Optic/Copper Cables		288 miles	\$4,741,018	44%	41%	0%	0%	15%		\$711,153
			\$273,319,447							\$183,268,232

## ► STATUS, CONDITION, AND VALUE

FACILITY	GASB34	STATUS	REPLACEMENT VALUE	CONDITION*						TOTAL UNMET NEED**
<b>STREETCAR</b>				<b>VG</b>	<b>G</b>	<b>F</b>	<b>P</b>	<b>VP</b>	<b>TBD</b>	
Streetcars	x	13	\$50,773,060	46%	54%					TBD
Tracks	x	14.5 centerline miles	\$66,409,200	52%	48%					TBD
Maintenance Facilities		17,871 square feet	\$4,688,772	100%						TBD
			\$121,871,032							
<b>AERIAL TRAM</b>				<b>VG</b>	<b>G</b>	<b>F</b>	<b>P</b>	<b>VP</b>	<b>TBD</b>	
Tramway and Related Structures/	x	1	\$54,292,721		100%					\$0
Equipment - Upper Station, Tower,										
Lower Station and Rolling Stock (including Cables)										
<b>TRAFFIC CALMING</b>				<b>VG</b>	<b>G</b>	<b>F</b>	<b>P</b>	<b>VP</b>	<b>TBD</b>	
Calming Devices	x	1671	\$3,778,800	15%	70%	10%	5%			\$566,820
<b>STREET LIGHTS</b>				<b>VG</b>	<b>G</b>	<b>F</b>	<b>P</b>	<b>VP</b>	<b>TBD</b>	
Option B (City Own & PGE Maintain)	x	44,076	\$25,035,168	3%	8%	36%	37%	16%		\$19,165,460
Option C (City Own & Maintain)	x	11,401	\$171,015,000	8%	28%	42%	10%	12%		\$39,255,978
		<b>55,477</b>	<b>\$196,050,168</b>							<b>\$58,421,438</b>
<b>STREET SIGNS</b>				<b>VG</b>	<b>G</b>	<b>F</b>	<b>P</b>	<b>VP</b>	<b>TBD</b>	
Street Name	x	39,826	\$4,858,772	3%	14%	21%	26%	36%		\$4,032,781
Parking	x	56,192	\$1,915,383		25%	25%	50%			\$1,436,537
Traffic Control	x	55,387	\$3,707,806	20%	27%	18%	25%	10%		\$1,965,137
<i>Stop Signs Only</i>	x	<i>14,885</i>		22%	30%	28%	13%	7%		<i>\$645,956</i>
Guide Signs	x	9,758	\$693,347		25%	25%	50%			\$520,011
Sign Mounts	x	78,179	\$13,022,823						x	\$879,360
			\$24,198,131							\$8,833,826
<b>PAVEMENT MARKINGS</b>				<b>VG</b>	<b>G</b>	<b>F</b>	<b>P</b>	<b>VP</b>	<b>TBD</b>	
Center Lines		729 pass-miles	\$719,362			50%	50%			\$359,681
Traffic Lane Lines		100 pass-miles	\$198,181			50%	50%			\$99,091
Bike Lane Lines		563 pass-miles	\$1,115,762			50%	50%			\$557,881
Edge Lines		272 pass-miles	\$539,054			50%	50%			\$269,527
Crosswalks		4,617	\$2,815,595			50%	50%			\$1,407,797
Stop Bars		2,696	\$245,135			20%	80%			\$196,108
Symbols & Words		20,489	\$2,485,737			30%	70%			\$1,740,016
Island Markings		558	\$268,265			70%	30%			\$80,480
Parking		2,269	\$583,843			25%	75%			\$437,882
			\$8,970,934							\$5,148,463

## ► STATUS, CONDITION, AND VALUE

FACILITY	GASB34	STATUS	REPLACEMENT VALUE	CONDITION*						TOTAL UNMET NEED**
<b>PARKING METERS</b>				<b>VG</b>	<b>G</b>	<b>F</b>	<b>P</b>	<b>VP</b>	<b>TBD</b>	
Single	x	410	\$333,330		90%	10%				\$0
Pay Station	x	1,343	\$11,235,538	89%		11%				\$0
		1,753	\$11,568,868							\$0
<b>PARKING FACILITIES</b>				<b>VG</b>	<b>G</b>	<b>F</b>	<b>P</b>	<b>VP</b>	<b>TBD</b>	
Parking Garages		6	\$108,600,000		67%	33%				\$0
<b>BUILDINGS</b>				<b>VG</b>	<b>G</b>	<b>F</b>	<b>P</b>	<b>VP</b>	<b>TBD</b>	
Albina Yard		46,706 square feet	\$1,867,460		10%	30%	60%			TBD
Sunderland Yard		16,402 square feet	\$312,990	50%		17%	33%			\$0
Kerby Building - Main/Shop/Office		54,318 square feet	\$4,281,700		10%	60%	30%			TBD
Kerby Building - Storage Building		6,000 square feet	\$320,510			30%	70%			TBD
Stanton Yard - Basement		91,260 square feet	TBD		10%	60%	30%			TBD
Valvoline Bldg		7,394 square feet	\$125,320		10%	30%	60%			TBD
			\$6,907,980							\$0
<b>FACILITIES SUBTOTAL</b>			\$8,119,464,567							\$1,534,968,415
RIGHT-OF-WAY		1,990 centerline miles	\$7,112,133,600							\$0
<b>TOTAL</b>			\$15,231,598,167							\$1,534,968,415

\*Not all assets are categorized using a 5-level condition assessment

\*\*The unmet need is defined as the amount of additional funding and resources needed to bring (restore) a given asset class to a fair or better condition and to maintain it at that condition.

NOTE: N/A= Not Applicable, TBD = To Be Determined, VG= Very Good, G= Good, F= Fair, P= Poor, VP= Very Poor

# Appendix A

## ► BRIDGES

*\* NOTE: Pictures of bridge rail are representative of condition described, but may not reflect the overall condition of the bridge to which it is attached.*

	DESCRIPTION	NBI CONDITION RATING <i>(Items 58, 59 &amp; 60)</i>	2013 CONDITION
 <p>SE Foster Rd over Johnson Creek (Rail)</p>	<p><b>VERY GOOD</b> No problems noted.</p>	8-9	8%
 <p>N Vancouver Ave over Railroad (Rail)</p>	<p><b>GOOD</b> Some minor problems</p>	7	43%


*\*Derived from FHWA Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation's Bridges*

*\*\*The lowest rating for any of these critical structural elements indicates the rating for the entire bridge.*


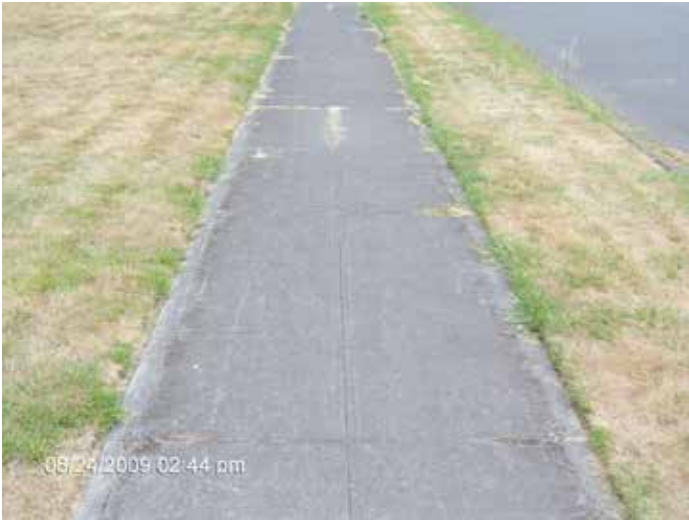



► BRIDGES CONT.



\* NOTE: Pictures of bridge rail are representative of condition described, but may not reflect the overall condition of the bridge to which it is attached.

	DESCRIPTION	NBI CONDITION RATING (Items 58, 59 & 60)	2013 CONDITION
 <p>N Vancouver Ave over Columbia Slough (Rail) – This bridge was rebuilt; however, the picture is representative of fair condition.</p>	<p><b>FAIR</b> Primary structural elements are sound but may have minor cracking or spalling.</p>	5-6	32%
 <p>SW Vista Ave over Jefferson Ave (Rail)</p>	<p><b>POOR</b> Deterioration of structural elements and/or weight restricted.</p>	4	17%
 <p>SW Capitol Hwy over Bertha Blvd (Rail) – This railing was replaced, but this picture is representative of very poor condition.</p>	<p><b>VERY POOR</b> Serious deterioration of primary structural elements. Local failures are possible.</p>	0-3	0%

► SIDEWALKS




	DESCRIPTION	2013 CONDITION
	<p><b>VERY GOOD</b> Newer concrete at correct slope and grade. No cracking beyond control joints. No step separations, spalls, or openings.</p>	10%
	<p><b>GOOD</b> Correct slope and grade. Some cracking beyond control joints. No step separations, spalls, or openings.</p>	25%
	<p><b>FAIR</b> Correct slope and grade. Some step separations, spalls, and openings less than ½ inch.</p>	30%

► SIDEWALKS CONT.

	DESCRIPTION	2013 CONDITION
	<p><b>POOR</b> Some raised and/or sunken areas. Step separations, spalls, and openings greater than ½ inch.</p>	25%
	<p><b>VERY POOR</b> Some raised and/or sunken areas more than 4 inches from original grade. Step separations, spalls, and openings greater than ½ inch. Some areas of sidewalk missing.</p>	10%



► CURBS

	DESCRIPTION	2013 CONDITION
	<p><b>VERY GOOD</b> Newer curb on correct slope and grade. No cracking beyond control joints. No spalls or openings.</p>	12%
	<p><b>GOOD</b> On correct slope and grade. Some cracking beyond control joints. No spalls or openings.</p>	50%
	<p><b>FAIR</b> On correct slope and grade. Some cracking beyond control joints. Some spalls and openings less than ½ inch.</p>	16%



► CURBS CONT.

	DESCRIPTION	2013 CONDITION
	<p><b>POOR</b></p> <p>Some vertical and horizontal move off original grade evident. Some cracking beyond control joints. Some spalls and openings greater than ½ inch.</p>	12%
	<p><b>VERY POOR</b></p> <p>Some vertical and horizontal movement off original grade with breakage. Cracking, spalling, and openings greater than ½ inch. Areas of curb broken off and/or missing.</p>	10%





► CORNERS

	DESCRIPTION	2013 CONDITION
	<p><b>VERY GOOD</b></p> <p>Newer corner ramps with tactile warning to current ADA standards. No cracks, step separations, or openings.</p>	10%
	<p><b>GOOD</b></p> <p>Corner ramps without tactile warnings. Correct slope and grade. Some cracks, step separations, and openings less than ½ inch.</p>	18%
	<p><b>FAIR</b></p> <p>Accessible corner ramps without tactile warnings. Slope and grade not to current ADA standards. Some cracks, step separations, and openings less than ½ inch.</p>	17%

► CORNERS CONT.




	DESCRIPTION	2013 CONDITION
	<p><b>POOR</b> No accessible ramps. Some heaving and/or sunken area(s). Cracks, step separations, and openings less than ½ inch.</p>	28%
	<p><b>VERY POOR</b> No accessible ramps. Some heaving and/or sunken areas. Cracks, step separations, and openings greater than ½ inch.</p>	27%

## ► STREET LIGHTS




OPTION B: City Owned and PGE Maintained OPTION C: City Owned and Maintained		DESCRIPTION	2013 CONDITION
 <p>Ornamental – Option C Light</p>		<p><b>VERY GOOD</b></p> <p>The street light is in new/near new condition. Everything is working properly. Re-lamping and photocell replacement is the usually the only requirement, but inspection of the pole and control systems should also be performed to confirm that everything is functioning normally.</p> <p>Age: less than 5 years</p>	<p>Option C: 8%</p> <p>Option B: 3%</p>
 <p>Ornamental – Option C Light</p>		<p><b>GOOD</b></p> <p>Scheduled preventive maintenance will keep the street light operational for the expected design life. Tree trimming around street lights may be necessary so that light is not obstructed from the roadway surface.</p> <p>Age: 6 - 15 years</p>	<p>Option C: 28%</p> <p>Option B: 8%</p>
 <p>Ornamental – Option C Light</p>		<p><b>FAIR</b></p> <p>The luminaire, pole, and control systems require regular preventive maintenance to keep the street light in operational status. Tree trimming around street lights may be necessary so that light is not obstructed from the roadway surface.</p> <p>Age: 16 - 25 years</p>	<p>Option C: 42%</p> <p>Option B: 36%</p>
 <p>Ornamental – Option C Light</p>		<p><b>POOR</b></p> <p>Poor = The street lighting system is near to the end of operational design life. Failures have increased due to luminaire, wiring, poles, and/or control system problems. Preventive maintenance will not reasonably extend the life much longer.</p> <p>Age: 26 - 30 years</p>	<p>Option C: 10%</p> <p>Option B: 37%</p>





► STREET LIGHTS CONT.

		DESCRIPTION	2013 CONDITION
 Ornamental – Option C Light    Anchor Bolt Deterioration		<p><b>VERY POOR</b></p> <p>The entire street lighting infrastructure has reached its intended design life and is in need of replacement. Replacement includes the luminaire, supporting arm, pole, wiring, and control systems.</p> <p>Age: Over 30 years</p>	<p>Option C: 12%</p> <p>Option B: 16%</p>
		<p>Twin Ornaments (Option C) blocked by tree branches – reducing effectiveness of lighting.</p>	
EXAMPLES OF OPTION B LIGHTING:			
			

## ► TRAFFIC SIGNAL HARDWARE

	DESCRIPTION	2013 CONDITION
	<p><b>VERY GOOD</b></p> <p>The signal is in new/near new condition. Everything is working properly. Preventive maintenance of the traffic signal cabinet is the major requirement, but examination of the hardware to be sure everything is nominal is the primary preventive maintenance activity for the hardware.</p> <p>Age: less than 7 years</p>	13%
	<p><b>GOOD</b></p> <p>Normally scheduled preventive maintenance will keep the signal operational for the expected design life. Timing should be examined and altered to be sure that it meets the operational needs of the intersection.</p> <p>Age: 8 - 14 years</p>	16%
	<p><b>FAIR</b></p> <p>The hardware infrastructure needs regular preventive maintenance to keep the signal in operational status. The signal controller is most likely at the end of its useful life, but a change out of the traffic signal cabinet or a partial replacement of the controller is likely to be needed.</p> <p>Age: 15 - 25 years</p>	19%

► TRAFFIC SIGNAL HARDWARE CONT.

	DESCRIPTION	2013 CONDITION
	<p><b>POOR</b></p> <p>The hardware infrastructure is close to the end of its useful design life. Operational failures have increased due to wiring and support hardware problems. Preventive maintenance can't reasonably extend the life much longer.</p> <p>Age: 26 - 35 years</p>	16%
	<p><b>VERY POOR</b></p> <p>The hardware infrastructure has reached its intended design life and is in need of replacement. Replacement includes the supporting pole and/or span wire as well as the display hardware and signal wiring.</p> <p>Age: 36 - 59 years</p>	36%

## ► PAVEMENT SYSTEM

\* NOTE: The Pavement Condition Index (PCI) is based upon visual inspection of City streets using the Metropolitan Transportation Commission methodology.



### DESCRIPTION

#### VERY GOOD

Pavement structure is stable with no cracking, no patching, no deformation evident. Streets in this condition are fairly new. Riding qualities are excellent. Nothing would improve the street at this time.

### PCI (0-100)

85-100

### 2012 CONDITION

Arterials and Collectors: 15%

Locals: 8%



#### GOOD

Pavement structure is stable, but may have surface erosion or minor cracking, minor patching and minor deformation. Riding qualities are very good. Some routine maintenance or rejuvenation of the wearing surface is all that is required.

75-84

Arterials and Collectors: 18%

Locals: 18%



#### FAIR

Pavement structure is generally stable with minor areas of structural weakness evident. Cracking is easier to detect. Although riding qualities are good, deformation is more pronounced and easily noticed. Seal coating or non-structural overlays are required to preserve pavement integrity.

65-74

Arterials and Collectors: 19%

Locals: 20%



#### POOR

Street has areas of instability, marked evidence of structural deficiency, large crack patterns, alligating, heavy and numerous patches, and very noticeable deformation. Riding qualities range from acceptable to poor. Base repair, grinding, and structural overlays may be required.



40-64

Arterials and Collectors: 37%

Locals: 38%



► PAVEMENT SYSTEM CONT.

	DESCRIPTION	PCI (0-100)	2012 CONDITION
	<p><b>VERY POOR</b></p> <p>Cracking and pavement deformation has progressed to the point that pavement is no longer structurally sound. The cost of rehabilitating the existing pavement will likely equal or exceed the cost of complete reconstruction.</p>	0-39	<p>Arterials and Collectors: 11%</p> <p>Locals: 15%</p>
	<p><b>UNPAVED</b></p> <p>Unpaved streets which are graded and are either dirt or gravel but for which there is no pavement or drainage.</p> <p>The City does not maintain these streets. Street improvements are made through the LID process.</p>	75-84	56.8 centerline miles